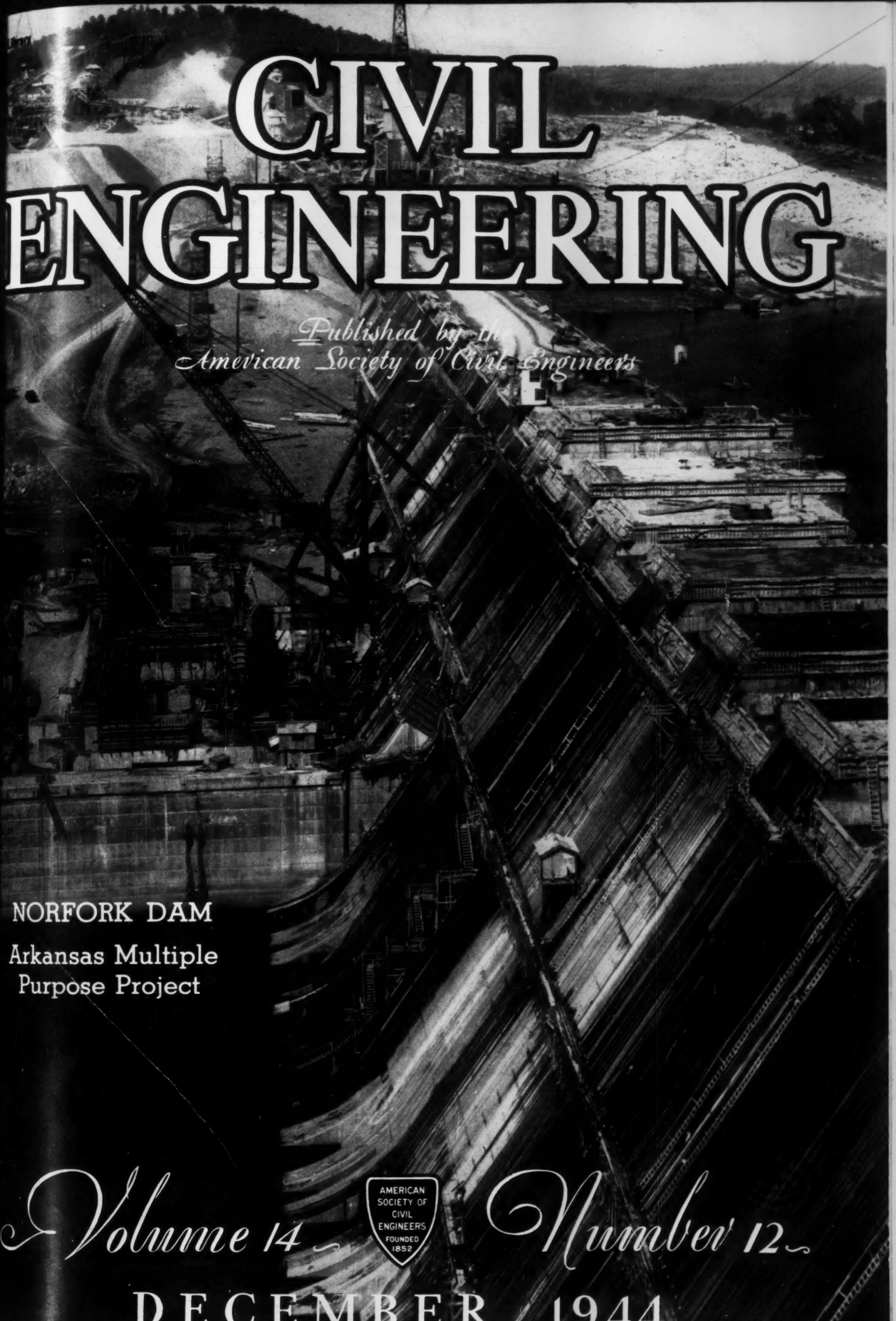
library

CIVIL ENGINEERING

Published by the
American Society of Civil Engineers



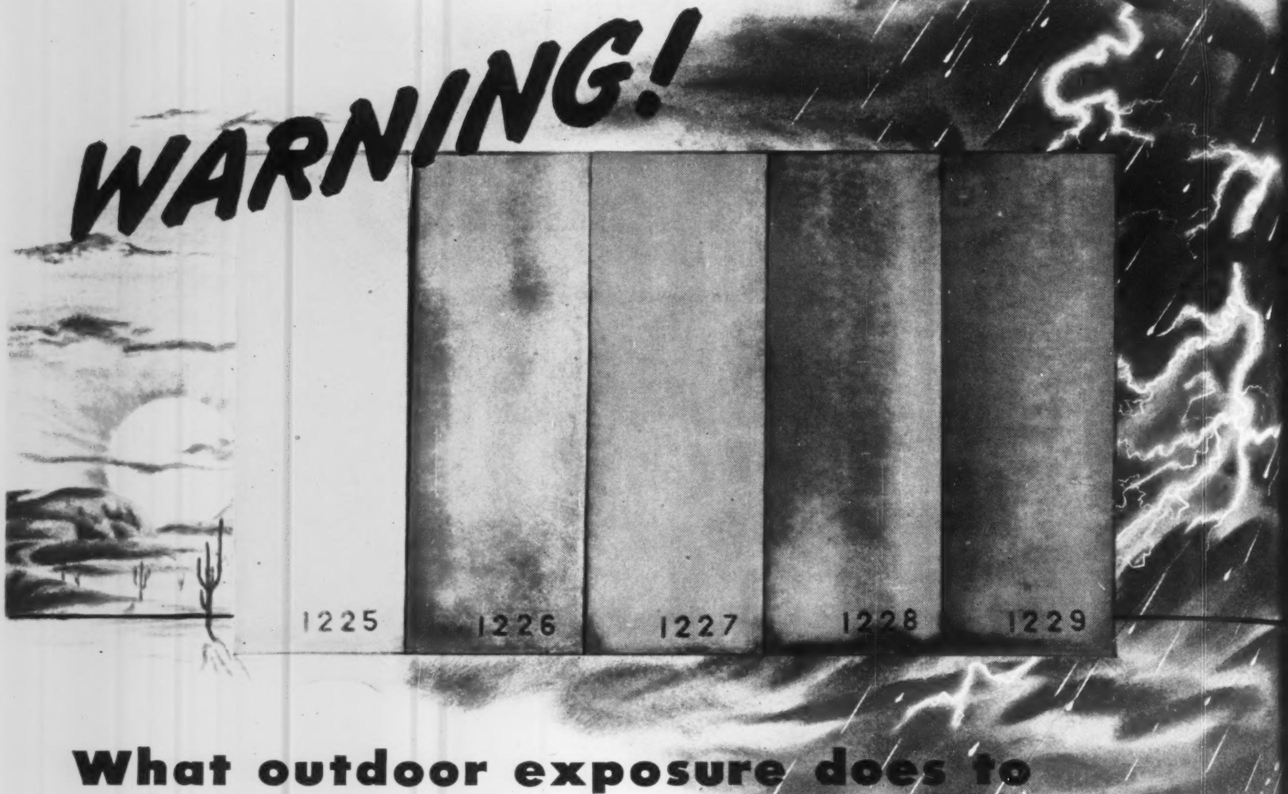
NORFORK DAM

Arkansas Multiple
Purpose Project

Volume 14 Number 12

DECEMBER 1944

PARTS



What outdoor exposure does to low-purity aluminum pigments

More graphically than words, this photograph tells the facts . . . facts vitally important to maintenance engineers.

These five test panels were painted with aluminum paints that were identical in every respect except the purity of the metal from which the pigment was made. Flake size was the same. Vehicle the same.

Panel No. 1225 was painted with Standard Alcoa Albron Paste No. 205, made from 99+% pure aluminum. Panel No. 1226, with pigment made from 95% aluminum. Panel No. 1227, from 91% aluminum. Panel No. 1228, from 90% aluminum. Panel No. 1229, from 87% aluminum.

You see what happened after 25 months exposure at New Kensington, Pa., Panel No. 1225, painted with Standard Alcoa Albron, retained excellent color and showed no failure. All of the panels painted with low-grade aluminum pigments darkened and rusted. Those painted with the pigments made of the two lowest purity metals were covered with rust over almost the entire surface, as shown by the dark areas in the photograph.

Clear proof, this, that high-grade aluminum is vitally important for making good aluminum pigment, especially if it is to be used on weather-exposed surfaces.

WARNING! Know what pigment you are getting! This is vital for long-lasting protection of steel structures. You can be sure the pigment is made of 99+% pure aluminum if it is Alcoa Albron, made by ALUMINUM COMPANY OF AMERICA, 1918 Gulf Building, Pittsburgh 19, Pennsylvania.

7 ADVANTAGES OF ALUMINUM PAINT

- High durability
- High reflectivity
- High hiding power
- Resistance to moisture
- Resistance to fumes
- Resistance to heat
- Attractive appearance

ALCOA
ALUMINUM

ALBRON *Pigments for* ALUMINUM PA

MADE UNDER PATENTS OF METALS DISINTEGRATING COMPANY, IN

Among Our Writers

D. J. FAUSTMAN (U. of Calif., B.S. in C.E. '37; Harvard U., grad. student in Transportation) spent two years as a traffic engineer with the Sacramento City Planning Commission, then entered the service in 1940. He was Air Base Engineer at Hamilton Field, Calif., before assignment to the Engineer Board at Fort Belvoir, Va., where he is now in charge of research on, and development of, direction-finding instruments.

GEORGE A. MANEY (U. of Minn., C.E. '11; U. of Ill., M.S. '14) taught at the U. of Minnesota for 13 years—as instructor, assistant and associate professor of structural engineering. Since 1927 he has been professor of structural engineering at Northwestern U. He developed the Maney deflection formula for reinforced concrete and was one of the originators of the "slope deflection" method of analysis.

H. V. PITTMAN (U. of Valparaiso, B.S. '03, C.E. '13) has practically grown up with the Army Engineers, including about 3½ years as Captain and Major of Engineers, World War I. He has been principally on construction of flood control and navigation projects in several Engineer Districts—with the Little Rock District since 1939.

A. E. GIBSON (Ohio State U., Mech. Eng. '09), except for a short period when he was vice-president and president of the Fulton Foundry and Machine Co., Cleveland, has been continuously with The Wellman Engineering Co., of Cleveland, of which he is now president. In 1938 he was the recipient, with Mrs. Gibson, of the Lincoln Arc Welding Foundation Grand Award.

C. G. CAPPEL (La. State U., in C.E. '12; R.P.I., postgrad. work) has been identified with the construction industry since 1912 both in design and construction. Since 1940 he has been project mangr. of several defense projects for W. Horace Williams Co., of which he is a partner.

HARVEY F. LUDWIG (U. of Calif. grad. in sanitary engineering, '38) in November 1942 was commissioned in the regular corps of the U.S. Public Health Service, and assigned to the office of Malaria Control in War Areas, with headquarters at Atlanta, Ga. Since August 1944 he has been detailed to the Health Division of the United Nations Relief and Rehabilitation Administration.

COLEMAN H. COOK (State U. of Iowa, B.S. in C.E. '17, C.E. '23) was Bridge Designer, Iowa Highway Commission, from 1917 to 1927, except for 18 months in the U.S. Army Air Corps. Since 1927 he has been Resident Engineer, Senior Bridge Designer, and Chief Designing Engineer, with the Texas Highway Department.

W. W. MOORE, after undergraduate and postgraduate study at Calif. Inst. of Tech., in 1938 formed a partnership with Trent R. Dames, specializing in foundation engineering. The firm of Dames & Moore has been retained as consultants on some 300-odd military and civilian war construction projects on the West Coast.

LAWRENCE B. FEAGIN (Vanderbilt U., B.A. '22; M.I.T., S.B. '24) has spent his entire professional career of 20 years with the U.S. Engineer Department on the Tennessee, Cumberland, and Mississippi rivers, becoming Head Engineer. Now a colonel in the Corps of Engineers, for the past 2 years he has served as District Engineer, St. Louis District.

AMERICAN
SOCIETY OF
CIVIL
ENGINEERS
FOUNDED
1852

VOLUME 14 NUMBER 12

December 1944

COPYRIGHT, 1944, BY THE
AMERICAN SOCIETY OF CIVIL ENGINEERS
Printed in U. S. A.

Entered as second-class matter September 23, 1930, at the Post Office at Easton, Pa., under the Act of August 24, 1912, and accepted for mailing at special rate of postage provided for in Section 1102, Act of October 3, 1917, authorized on July 5, 1918.

CIVIL ENGINEERING

Published Monthly by the
AMERICAN SOCIETY OF CIVIL ENGINEERS
(Founded November 5, 1852)

PUBLICATION OFFICE: 20TH AND NORTHAMPTON STREETS, EASTON, PA.
EDITORIAL AND ADVERTISING DEPARTMENTS:
33 WEST 39TH STREET, NEW YORK 18

This Issue Contains

COVER—Norfork Dam (*See article page 499*)

NEW MAPPING INSTRUMENT DEVELOPED BY CORPS OF ENGINEERS 493
D. J. Faustman

HIGH-STRENGTH REINFORCED CONCRETE COLUMN DEVELOPED . . 496
George A. Maney

NORFORK DAM IN ARKANSAS NEARS COMPLETION. II. Construction Procedures for Concrete Structure 499
H. V. Pittman

ORE AND COAL HANDLING ON THE GREAT LAKES 503
A. E. Gibson

TIMBER HANGAR ERECTED FROM 16-STORY SCAFFOLD 507
C. G. Cappel

ENGINEERING ASPECTS OF MOSQUITO CONTROL. III. Program of U. S. Public Health Service to Combat Dengue and Yellow Fevers 509
Harvey F. Ludwig

TEXAS HIGHWAY BRIDGE OF CONCRETE ARCHES DESIGNED TO RESIST FLOOD FLOWS 513
Coleman H. Cook

PACIFIC COAST QUAY FOUNDED ON DEEP CLAY 515
W. W. Moore

THE GREAT FLOODS OF 1943 AND 1944 ON THE MIDDLE MISSISSIPPI RIVER 518
Lawrence B. Feagin

ENGINEERS' NOTEBOOK
- Engineer Corps Measures Progress by Types of Bridges Erected 521
  J. A. Hamilton
- Simplifying Traffic-Lane Delineation 522
  Otto K. Jelinek

OUR READERS SAY 523

SOCIETY AFFAIRS 526

ITEMS OF INTEREST 540

NEWS OF ENGINEERS 543

DECEASED 544

CHANGES IN MEMBERSHIP GRADES 14

APPLICATIONS FOR ADMISSION AND TRANSFER 16

ENGINEERING SOCIETIES' PERSONNEL SERVICE 22

RECENT BOOKS 22

CURRENT PERIODICAL LITERATURE 24, 26, 28, 30, 32

EQUIPMENT, MATERIALS AND METHODS 34, 35, 36, 37, 38, 40

INDEX TO ADVERTISERS 44

The Society is not responsible for any statements made or opinions expressed in its publications.

Reprints from this publication may be made on condition that full credit be given CIVIL ENGINEERING *and the author, and that date of publication be stated.*

SUBSCRIPTION RATES

Price 50 cents a copy; $5.00 a year in advance; $4.00 a year to members and to libraries; and $2.50 a year to members of Student Chapters. Canadian postage 75 cents and foreign postage $1.50 additional.

Member Audit Bureau of Circulations

BEFORE THE PARADE

ELCOME HOME!
TRANSCONT
OOP 60
ENT

...JOBS MUST BE MADE

WHEN THEY COME BACK HOME, we'll all be there with cheers and shouts . . . but that's not enough. *We must be there with jobs.* For remember, when the parade is over, the men of your community will need plenty of work to carry them over the "war-to-peace conversion" period.

That's why *today* it is up to your municipal officials to start planning the Public Works Programs which will put your local citizens back to work—right in your own home town.

In water supply, sewerage and drainage projects, the Lock Joint Pipe Company is prepared to set up temporary plants in your community. Such a project will employ up to 90% of its workers from your locality . . . help your merchants through the local purchase of a large quantity of supplies and materials . . . and circulate most of the money in your own community.

By specifying Lock Joint Concrete Pipelines, you'll have jobs ready for your engineers, mechanics, laborers and other skilled workers—and you'll be installing pipelines which will give you a century of useful service.

Whether your project is large or small, for the present or future, your 'phone call, telegram, cable or letter to any of our offices will bring a prompt reply.

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

LOCK JOINT PIPE COMPANY
Established 1905
AMPERE, NEW JERSEY
Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill.
Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES *Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply Mains as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.*

Malcolm Pirnie
President
George T. Seabury
Secretary
Sydney Wilmot
Editor in Chief and
Manager of Publications
Don P. Reynolds
Assistant Editor

CIVIL
ENGINEERING

Committee on Publications
Scott B. Lilly
Chairman
N. W. Dougherty
S. C. Hollister
Fred C. Scobey
Wilbur M. Wilson
W. L. Glenzing
Advertising Manager

Volume 14 December 1944 Number 12

New Mapping Instrument Developed by Corps of Engineers

By D. J. Faustman, Assoc. M. Am. Soc. C.E.
Captain, Corps of Engineers, The Engineer Board, Fort Belvoir, Va.

How many times have engineers dreamed of an instrument that would automatically plot reconnaissance surveys? If only the back-breaking effort and also some of the inaccuracies could be eliminated! Well, the Army thought that would be a good thing too. Also they knew it would be essential to locate mechanized forces accurately and rapidly. Therefore with characteristic directness the odograph was worked out and put into production. Although this instrument, here described by Captain Faustman, has been in operation for some time, military security has precluded any announcement until recently.

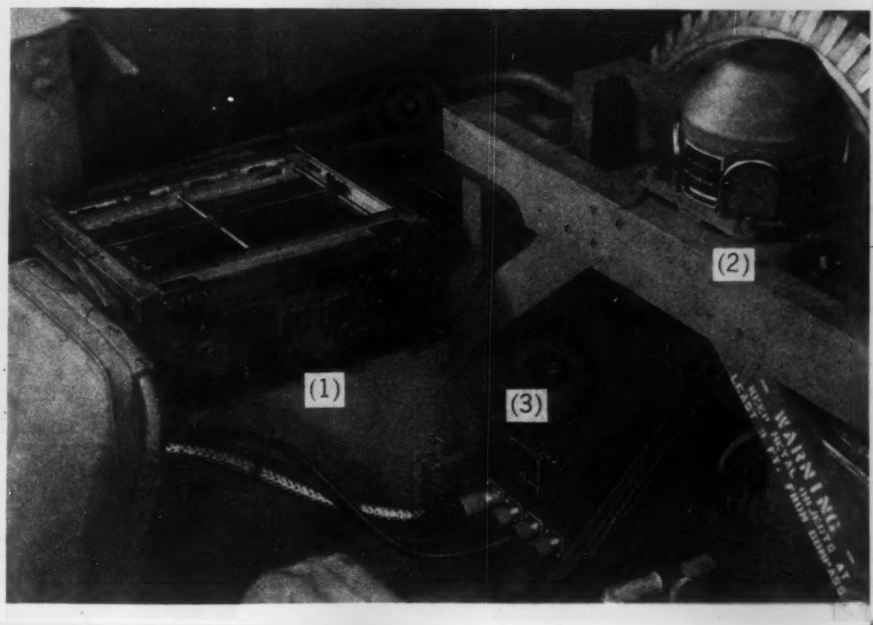
The requirements for an instrument by which to obtain accurate and continuous directional control and orientation of rapidly moving elements in modern fluid warfare have been satisfied by the development of the odograph, an instrument that automatically plots the course taken by a moving vehicle. Over a period of years there have been many attempts to develop such a device for rapid route surveys, but a preliminary investigation revealed that none had advanced beyond the planning and experimental stage. The Engineer Board was, therefore, directed by the Chief of Engineers to undertake the basic development and research to produce an instrument suitable for military use.

Because of the large amount of research required, the Army requested the assistance of the National Defense Research Committee, which turned the problem over to three organizations—the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, D.C., the Monroe Calculating Machine Company, and the International Business Machines Corporation. After an intensive cooperative research and test program, models were produced possessing the necessary ruggedness, reliability, and accuracy for military operations. The odograph was then placed in quantity production and the first units were distributed to troops in August 1943.

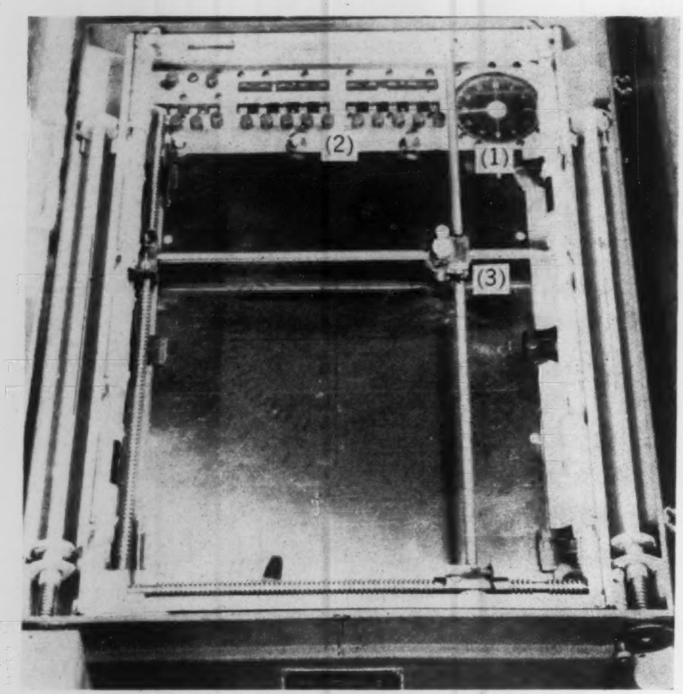
In order to plot a course it is necessary to know the direction of travel and the distance traversed. Thus, a mechanical instrument to accomplish this function must contain: (*a*) a distance-measuring element which is moved or turned by an amount proportional to the actual distance traveled; (*b*) a compass element which provides a fixed reference direction; and (*c*) an integrator which provides for the resolution of the direction of motion into components, one parallel to, and one perpendicular to, the reference direction, and provides also for the summation or integration of the distance components. In other words, the plotting unit of the instrument must perform the mathematical operation of adding up the components of $S \sin A$, where S is the distance traveled and A is the angle of azimuth of the vehicle's heading with respect to the reference direction maintained by the compass.

In the odograph, direction is obtained from a magnetic compass properly compensated for the magnetic effects of the metal of the vehicle, and distance is determined from the speedometer drive take-off in the vehicle transmission. (The vehicle used by the Army is the $^1/_4$-ton truck commonly called a "jeep.") The direction indication is transmitted from the compass to the plotting unit by a system employing a light beam, photocells, and related electronic control circuits and mechanisms. A vibrator, rectifier-type power pack steps up the vehicle battery voltage for use in the electronic circuits.

Owing to the effect of the vehicle's magnetic field, a magnetic compass in a vehicle will not, unless compensated, line up with the magnetic meridian. As the vehicle is assembled it assumes the character of a single, integral piece of magnetic metal. Actually, however, the intensity and direction of this magnetic field changes slightly as the vehicle is subjected to road shocks, vi-



Odograph Installed in a Jeep
Parts Are (1) Plotting Unit, (2) Magnetic Compass, (3) Electrical Power Pack



MAP TABLE OF PLOTTING UNIT
(1) Azimuth Dial, (2) Mileage Counters, (3) Plotting Pencil

bration, changes of temperature, and various other causes. Thus, a check on the compass compensation is required every several days. This check is simple to make and requires about 15 minutes. In compensating the compass, the field of the vehicle is considered as broken down in three components—lengthwise, crosswise, and vertical. Small rotatable bar magnets, appropriately placed with respect to the magnets in the compass, neutralize or compensate for the effect of the permanent magnetic field of the vehicle. In addition, to neutralize the magnetism that may be temporarily induced in the vehicle by the earth's magnetic field, small collars of permalloy are placed so as to balance the resultant mass of the induced iron in the vehicle.

The odograph has an infinitely variable type of map-scale gearing and can plot maps to any scale from 1:20,000 to 1:500,000. The map table will hold an $8^1/_2$ by 11-in. sheet of paper. Counters are provided which indicate the number of miles traveled east or west, and north or south, of a given starting point. A means is incorporated whereby adjustments can be made so as to set in the magnetic declination, thus plotting on true north headings. The general size of the various components is observed in the accompanying photographs. The weight of the entire installation is approximately 200 lb.

There are several sources of error which reduce the overall accuracy of the odograph, namely: direction error (compass), distance error, slope-distance error, and mechanical error.

1. Direction error (compass). The magnetism of a vehicle changes when the vehicle is subjected to shock. Thus, in driving over rough terrain, the magnetism changes more than on smooth terrain, and a larger error is to be expected. Rough terrain disturbs the dynamic balance of the compass, with some lowering in accuracy because of the fluctuations of the compass card. Compass errors are the major source of error in the odograph, and may amount to 2% or more.

2. Distance error. The distance input is taken off the speedometer (odometer) drive gear in the vehicle transmission. The distance input will be most accura when operating on hard smooth surfaces, with standar tires inflated at the recommended pressure. On loo or rough surfaces, some slippage will occur. Th amount of slippage depends upon several factors, an fixed rules covering the many conditions that may b encountered cannot be set up. When a vehicle become stuck in soft sand or mud, the wheels may sp considerably before the vehicle gets out. In such a cas the odograph would be turned off until the vehicle free. The distance input error may amount to as muc as 2% under bad conditions of slippage.

3. Slope-distance error. The odograph records th actual distance traveled over the ground. In terrai with many hills, the odograph will show a slightly greate mileage than the distance scaled from a map, as the ma is a projection of the terrain. It has been found that th error can be regarded as negligible, unless an unusua number of steep up-and-down grades are encountered For example, a 10% grade will give a 1% error.

4. Mechanical error. A certain amount of play an lost motion exists in the various mechanical gear sys tems. Close manufacturing tolerances hold these error to 0.5%.

Because of the variable nature of the several source of error, particularly changing magnetism and whee slippage, the direction of the error on a given run can not be predicted. The magnitude of the error, however can be predicted generally from a consideration of th type of terrain to be traversed. On roads, the errors o closure will average between 1 in 75 and 1 in 200, wherea on rough, cross-country terrain the error will averag between 1 in 35 and 1 in 75.

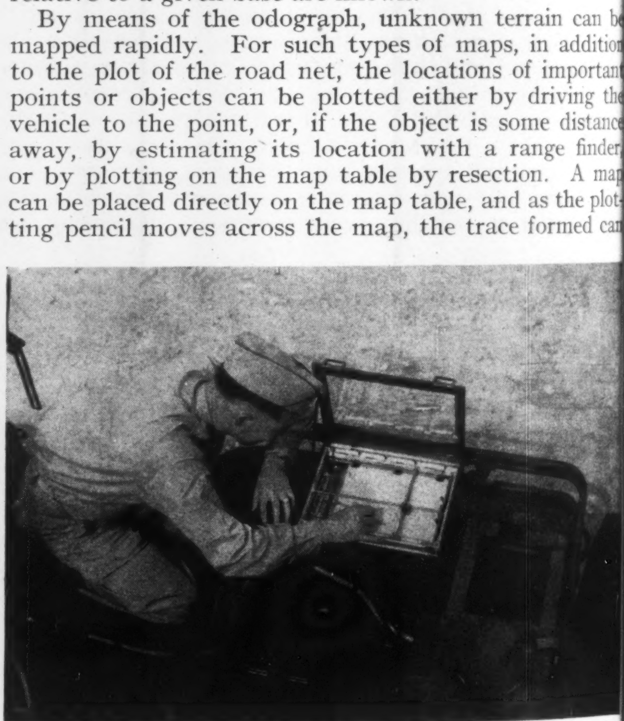
MILITARY USES OF INSTRUMENT

The military uses of the odograph may be roughly divided into two classifications:

1. Map making, or plotting the position of observed objectives relative to a given base.

2. Navigation, or finding objectives whose positions relative to a given base are known.

By means of the odograph, unknown terrain can b mapped rapidly. For such types of maps, in additio to the plot of the road net, the locations of importan points or objects can be plotted either by driving th vehicle to the point, or, if the object is some distanc away, by estimating its location with a range finder or by plotting on the map table by resection. A ma can be placed directly on the map table, and as the plotting pencil moves across the map, the trace formed ca



NOTATIONS CAN BE MADE DIRECTLY ON THE MAP TABLE be compared with the map to ascertain that the correct route is being followed.

To reach a given objective, the position of which is known relative to the starting point, the objective is plotted, to scale, on the map table and the vehicle then driven in the general direction of the objective, following roads or other convenient routes. Since the relative location of the objective is always evident from the odograph map, the vehicle can reach the objective without previous knowledge of the terrain and road net. The odograph has been found to be particularly valuable at night when guiding landmarks are not visible.

As a navigational instrument, the odograph possesses several advantages over the usual means of dead reckoning. The automatic operation relieves the navigator of many duties, or will accomplish dead reckoning when no navigator is present. Any route can be followed, and it is not necessary to follow the route laid out, since wherever the vehicle goes, the plotting pencil will show the actual location relative to the intended route.

From a consideration of the function of the odograph installed in the $^1/_4$-ton truck, together with a study of its operating characteristics and accuracy, several postwar applications are indicated. In these applications, a comparison with present methods and techniques reveals that with the odograph there will be a considerable saving in time, with resulting economies, and in most cases a higher degree of accuracy.

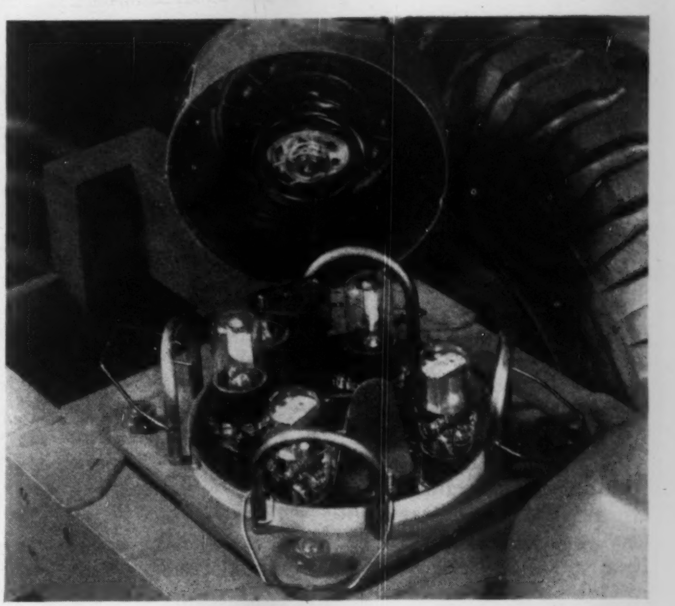
Since it is basically a reconnaissance instrument, the odograph will find its greatest uses in reconnaissance surveying and mapping. As has been explained, an accuracy can be obtained such that the error of closure will be from 1 in 35 to 1 in 200. While the highest degree of accuracy obtained by this instrument is considerably lower than that secured in transit and tape surveys, it approaches the accuracy of certain classes of stadia work, and is considerably better than pacing and similar methods.

ADAPTED TO WIDE DIVERSITY OF TERRAIN

Because of the high maneuverability of the $^1/_4$-ton truck, undue restrictions are not placed on the odograph as to the type of terrain on which it can be used, excepting, of course, rugged mountains or heavy timber. Practically any type of trail can be negotiated by the $^1/_4$-ton truck, and for cross-country operations it has no equal. Thus, the equipment will have particular value in all types of route reconnaissance surveys for highways, transmission lines, and similar projects. This type of reconnaissance survey can be rapidly made, while pertinent data can be noted directly on the odograph map table as encountered en route. Such data include the general rise and fall of the country, possible ruling grades, classification of material, drainage, and limiting ridge and valley lines.

A considerable saving in time and an increase in accuracy will be effected by the odograph as compared with the usual reconnaissance method of running a line by compass angles, and determining distances by pacing, stadia, or chaining. Since the odograph embodies no means of determining elevation, the use of an aneroid barometer is indicated. The odograph trace can be correlated with, and plotted on, an aerial photograph. The infinitely variable map scale feature makes it possible to plot to the scale of the aerial photograph used.

The odograph is admirably adapted to geophysical surveys for oil and gas. In a general preliminary survey of a large area by gravity or magnetic methods, the odograph can continuously record the location of observations taken with a gravimeter or magnetometer.



COMPASS WITH BOWL ASSEMBLY RAISED TO SHOW PHOTOTUBE SYSTEM WHICH TRANSMITS DIRECTIONS TO PLOTTING UNIT

In this type of work, under present methods the cost of the survey crew may be several times the cost of the geophysical observations themselves. In reflection seismograph surveys, not only can the odograph be used to plot the position of shot points, but the detectors can be rapidly placed in position by plotting their required position on the odograph map and then driving to the position as indicated on the map by the plotting pencil. This is the procedure used by a Field Artillery Observation Battalion in setting up a sound-ranging base.

It may be of interest to note, in passing, that some of the early attempts to develop an odograph were made by designers of geophysical instruments. Geological surveys will be facilitated by the odograph because various types of soil and rock formations can be traced out, plotted, and thus coordinated on the odograph map sheet.

Another profitable use of the equipment will be for highway inventory surveys. As the odograph is driven over the road, alinement will be automatically plotted, and information on type, width, and condition can be placed directly on the map. Details, such as railroads, bridges, sidewalks, grade crossings, buildings, and homes, can be accurately noted on the map as they are passed.

General area surveys of timber tracts and crops can be accomplished by touring the boundaries, thus making a closed traverse to an appropriate scale. Areas can be determined with a planimeter or by other methods.

Some of the military uses of the instrument will be applicable in postwar operations. For example, the navigation and dead-reckoning features will be utilized for oil-well explorations in barren areas such as Arabia, and for mineral explorations in roadless areas in Canada and Alaska.

The Engineer Board, the development agency for the Corps of Engineers, is directed by Brig. Gen. John W. N. Shulz, President, with Col. W. J. Matteson as Executive Officer. The general responsibility for the development of the odograph was assigned to Technical Division II, with Lt. Col. W. W. Milner, Assoc. M. Am. Soc. C.E., Division Director. The work was carried out by the Applied Electronics Branch, with Maj. G. A. Rote, Branch Chief. The writer was in immediate charge of the development and production of the instrument.

High-Strength Reinforced Concrete Column Developed

Northwestern's Technological Institute Utilizes Pre-Stressed Spirals

By George A. Maney, M. Am. Soc. C.E.

Chairman, Civil Engineering Department, Northwestern University, Evanston, Ill.

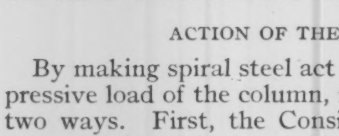
Tests indicate that a new compression member of reinforced concrete will be stronger and cheaper than steel and as light as an aluminum member which would carry the same load. This high-strength column has been developed as a part of the War Production Board's research program to discover new materials and designs. The unit here described by Professor Maney can be produced at about one-third the cost of a comparable steel column. Loads as high as 83,000 lb per sq in. have been applied to the unit without failure.

A revolutionary substitute for structural steel columns has been tested successfully at the Northwestern Technological Institute. The unit, for use in buildings, bridges, and special foundations, is composed of highly compressed concrete, stronger than any produced heretofore, encased in a spiral of steel wiring. A small model, 80% concrete and 20% steel, has supported loads greater than those of a solid steel column of the same size.

What are the changes that will increase the compressive strength of reinforced concrete columns? A higher-strength compression member in reinforced concrete must develop the following actions. First, the load-carrying efficiency of the spiral steel in the column must be developed. In other words, this spiral must take load from the very beginning, and not as is now the case, after the concrete has failed. Its load-carrying efficiency is then between 2 and $2^1/_2$ times the value of vertical steel with the same unit stress.

ACTION OF THE SPIRAL STEEL

By making spiral steel act in tension to carry the compressive load of the column, its efficiency is multiplied in two ways. First, the Considere ratio is 2.4 times the value of the ratio for vertical steel, and second, much greater unit stress values are obtained in the high-strength wire of the spiral than are secured in structural steel. Call the first ratio 2, and the second 3. Then 1 lb of steel in this pre-stressed and specially fabricated spiral shape is made to carry as much compressive load as 6 lb of high-grade structural steel. It is possible to manufacture high-strength wire with a working stress of 80,000 lb per sq in. for about the same price per pound as alloy structural steel, which will not carry more than 25,000 lb as a safe unit stress.



High-Strength Compression Unit 8.3 In. in Diameter, Carrying 3,100,000-Lb Load

A method of manufacture developed at Northwestern University makes it possible to take advantage of this 500% increase in the carrying capacity of steel, and similarly to multiply the concrete strength. As little water as 1 to $1^1/_2$ gal per sack of cement has been successfully used in specimens. The same operation which pre-stresses the spiral steel from the very beginning, places the concrete under a pressure of at least 20,000 lb per sq in. while it is being strenuously vibrated. This method of mixing or compaction has been known to squeeze water out of and make workable, a specimen using only $1^1/_2$ gal of water per sack of cement. It is only by this method of pressure and vibration—which is, of course, not suited to ordinary field construction—that this high-strength concrete can be obtained.

Our test results indicate that by this method a concrete can be secured having a modulus greater than that of aluminum and having also a satisfactory stress-strain curve for the compression unit. Much experimental work remains to be done but the principles are as indicated, and the possibilities are very great. Such a compression unit would have to be shop-manufactured like reinforcing steel or structural steel columns. It can be used as one complete column (covered with a fire-protection layer of concrete which is not designed to carry load), and as a substitute for compression steel in larger sizes than reinforcing bars. It can be used as compressive beam reinforcing as well as a load-carrying unit in columns. The use of such a unit greatly enlarges the field of reinforced concrete construction. Again it may be said that any form of construction that multiplies by at least 6 the present load-carrying capacity of steel, and also greatly increases the load-carrying capacity of concrete, must be considered in the economy of future construction.

These load-carrying units, which vary in outside diameter from 2 to 8 in. as tested to date, and which use from 10% to 30% of steel by volume, and from 70% to 90% of concrete by volume, must be made under special conditions of manufacture combined with very high pressure and vibration. Instead of a form outside the spiral, a steel or sheet-metal pipe-shape form is used just inside the spiral. This inside form is the secret of the successful manufacture of these specimens. It enables practically dry, fresh concrete—in which not even enough moisture is used to make the original mixture appear moist—to become workable in the process of manufacture. The inside pipe is filled with concrete and is submitted to high pressure plus vibration.

UNIT UNDER INITIAL TENSION

The form which contains the concrete under this action also applies the load to the high-strength spiral wire. It has been discovered that when concrete is compacted in this way by very high unit pressure plus vibration, it need only be treated thus for a period of less than a minute. Then, when the load-applying unit is removed from the specimen, the concrete has enough strength to throw the enclosed spiral steel into initial tension and keep it that way.

As a result of this operation, the unit remains in a condition of initial tension in the spiral during the whole process of manufacture and curing, and begins to take load as a load-carrying unit with the spiral in initial tension. The optimum amount of this initial tension has not yet been determined, but this is the element which is equally responsible with the high-strength concrete for the great strength of these units.

The amount of steel used in the inside core should be reduced to a minimum because this element, although necessary, does not have a high load-carrying capacity. It must be high enough to take the lateral pressure employed during manufacturing without deformation. In some of the specimens made, an unusually large amount of steel has been employed.

The ideal cross section of the spiral wire, in order to reduce the inside form material to a minimum, should be rectangular or flat, so that the inside lining is subjected to very little local bending when pressed out against the spiral. It should here be pointed out that experimental work on this development is in the initial stages and that many details and combinations remain to be tested.

Actually the tensile spiral steel is made to take compressive load from the very beginning, a fact which is not true of the ordinary concrete column with spiral reinforcement. In this commonly used form, the strength of the spiral can be employed only to increase the ultimate load and not to increase the elastic-limit load. For this reason, any great use of a high-strength spiral has not been developed.

It is evident that the load-carrying capacity of the steel element of the unit is almost doubled, if the volume percentage of spiral steel is doubled, or if the same percentage is kept and the allowable unit stress in the spiral is doubled. It does not cost nearly twice as much to manufacture a spiral with twice the strength. Concrete as ordinarily placed on the job requires a workability which takes 6 to 8 gal of water per sack of cement to obtain. By using one-quarter to one-sixth as much water, 4 to 6 times the strength can be obtained merely because of the abnormally high pressure, plus vibration, which can be used under shop conditions.

RESEARCH IN INITIAL STAGE

A considerable amount of research remains to be done to determine the combination of concrete materials, pressure, and vibration which will produce a maximum strength together with a maximum modulus of elasticity in the concrete. It is believed that higher values of initial strength in spiral wire will produce higher initial moduli in the units. It is also believed that units can be manufactured with about the same average weight as structural aluminum and with higher moduli of elasticity.

In the interests of conserving iron ore, the possibilities of this type of load-carrying unit are unlimited, as it can be used in most of the structural fields. It can be used in buildings to cut down the size of the inside columns and to make possible skyscrapers of concrete. Heretofore, column sizes have limited the height of concrete buildings. It can be used as the compression unit of the rib of a concrete reinforced bridge to produce spans that have heretofore not been dreamed of in reinforced concrete. It can be used in temporary construction to save at least three-quarters of the total amount of steel required. It can be used in the compression flanges of large reinforced beams and girders to greatly reduce their size, and to increase their resistance to time deformation—the so-called "plastic flow."

Behavior of several specimens under test is shown in the accompanying stress-strain curves (Figs. 1, 2, 3, and 4). In all cases the average diameter of the outside spiral is used in determining the area of the unit. The average unit stresses on the compression member are therefore somewhat less than those on the concrete alone.

A neat cement specimen was tested (Fig. 1) in which 1 gal of water per sack of cement was used. The specimen had 11% of high-strength spiral wire and 3.3% of sheet-metal liner by volume. A unit pressure of 11,800 lb per sq in. was used in compacting and vibrating during manufacture. It should be noted that a unit stress of about 47,000 lb per sq in. was developed at failure with an initial modulus of elasticity of about 9,400,000. With higher spiral percentages and greater pressure during manufacture, higher values are to be expected. It is believed that more complete compaction was made possible by the omission of sand and gravel.

At another time, a specimen was tested which contained a concrete of 1:0.5:0.715 mix by weight with $2^1/_4$ gal of water per sack (Fig. 2). This specimen contained 19% of high-strength spiral wire and 1.5% of sheet-metal liner by volume. A unit pressure of 2,875 lb per sq in. was used in compact-

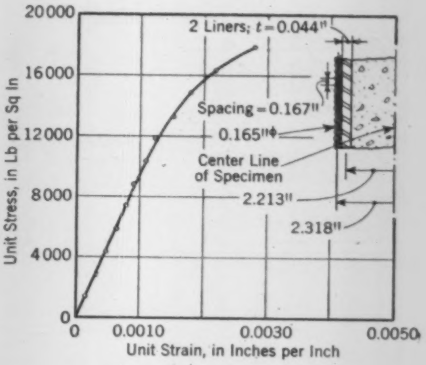


Fig. 1. Test Results on a Specimen Made with Neat Cement

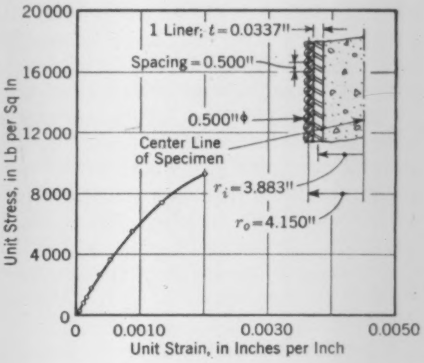


Fig. 2. Test on Specimen Indicating Need for Higher Pressures During Manufacture

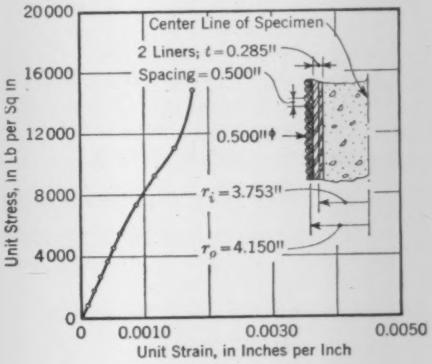


Fig. 3. Test on Specimen with Thick Liner

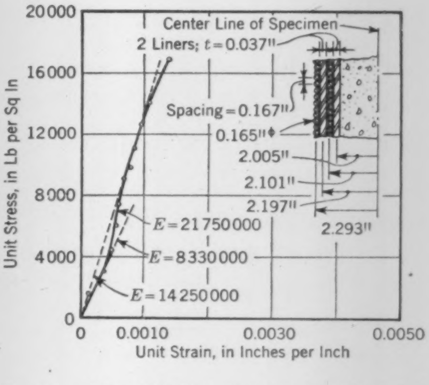


Fig. 4. Test on Specimen with Double Spiral

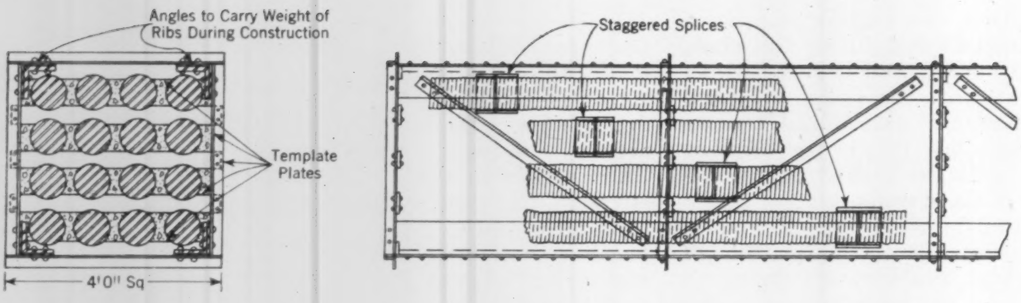


Fig. 5. Details of Compression Arch Rib Made Possible by Use of High-Strength Units

ing and vibrating the unit during manufacture. About 39,000 lb per sq in. was the stress on the unit at failure with an initial modulus of elasticity of about 7,300,000. This shows the need for higher pressures in manufacture.

The effect of variation in the thickness of the metal liner is shown in Fig. 3. The specimen made up for this test was composed of a concrete core, of 1:0.5:0.715 mix by weight, with $2^1/_2$ gal of water per sack, a high-strength spiral wire (19% of the total volume) and a sheet-metal liner which made up 12% of the total volume. A unit pressure of 13,500 lb per sq in. was used in compacting and vibrating during manufacture. The unit stress at failure reached about 55,000 lb per sq in., with an initial modulus of elasticity of about 8,500,000. The percentage of metal liner in this specimen was excessively high. A total load of 3,100,000 lb was applied before failure occurred.

In still another specimen (Fig. 4), a double spiral was used. Concrete for the core was 1:0.5:0.715 mix by weight with $2^1/_2$ gal of water per sack of cement. The percentage of high-strength spiral wire was 21.4% of the total volume, and that of the sheet-steel liner was 6%. A unit pressure of 18,200 lb per sq in. was used in compacting and vibrating. A load of about 57,000 lb per sq in. was placed on the unit without failure, with the modulus indicated by the curve. The curve also shows how the spirals took up the load at different points. The ultimate capacity of the testing machine was reached without failure (1,002,000 lb).

INTERESTING POSSIBILITIES INDICATED

It is felt that much higher values of modulus of elasticity and more satisfactory stress-strain curves can be obtained with the further development of the two following conditions:

1. An optimum combination of high unit pressure of at least 20,000 lb per sq in. plus vibration.
2. An optimum value of the initial stress in the spiral.

It is interesting to note that this initial stress in the spiral, which is essential to the action of the unit, has been introduced and kept in from the very beginning by the operation of less than one minute of combined pressure and vibration on the specimen. Many more experiments are necessary in order to bring out these optimum conditions, but the following interesting facts remain with reference to the tests:

1. A specimen of 8.3 in. in diameter carried a load of 3,100,000 lb per sq in. in a 5,000,000-lb testing machine before failure occurred.
2. Another specimen with a diameter of 4.6 in. took the full load of the million-pound machine without failure. This was the specimen of Fig. 4.
3. By this method of carrying compressive load through the lateral action of a spiral in tension, the compressive load capacity of a pound of steel can be increased by at least 500%. Since compressive load-carrying members are so numerous and common in all our structural work, the conclusion is evident that sooner or later, with the great need for economy in the use of our iron-ore resources, such a method of carrying load must be developed.
4. At least 300% or 400% increase in the load-carrying capacity of concrete can be obtained.

The water-cement ratio law indicates that if it is possible to get a workable concrete and still cut the amount of mixing water in half, the strength of this concrete will be approximately doubled. In the case of these examples, 1 to 2 gal of water was used instead of 6 to 8 gal, as is the custom. What seemed to be a perfectly dry concrete mixture was made workable by the combination of high pressure and vibration used in manufacture. With $1^1/_2$ gal of water per sack of cement, it was possible to squeeze out excess mixing water not needed and get very high strength for the load-carrying unit.

USES OF THE UNIT

Practical application of this high-strength compression unit to many important types of engineering structures is entirely feasible. One of the great handicaps of the reinforced-concrete frame building has been the large diameter needed for the inside columns of the lower stories. In many cases, a reinforced-concrete frame building has been decided against in favor of a steel frame building for this very reason. With the use of these units, it is safe to say that inside-column diameters for the lower floors can be made as small as, or smaller than, those for structural steel. A 6-in. load-carrying unit will carry design loads up to half a million pounds. Since only a small percentage of column loads are greater, this would seem to be the most common case. If a 6-in. column core is used, there is ample room for the beam steel at the floor levels if a column 12 in. in outside size is used.

For columns of safe capacity up to a million pounds, an 8-in. core may be used, which allows for 2 in. of protective concrete all around. It is safe to say that very few columns would need to be greater in outside dimension than 12 in., except where a very high ceiling is desired such as in the first story of an office building. A tremendous simplification of concrete column construction would result if the 12-in. column size were made the standard for all upper stories. More important is the possibility of extending the use of reinforced concrete, with its much greater economy, to the skyscraper-type building of the future.

The unusual value of such a compression unit for the design of a long-span concrete arch is shown in Fig. 5. Although this is only a tentative design, it illustrates the possibilities of this material for long-span construction where the dead weight of a structure is much more important than the live load carried by the structure. The writer knows of one concrete arch bridge in this country with a span of less than 500 ft where the average cross section of each of the two ribs is 12 ft by 12 ft of solid concrete.

This illustration (Fig. 5) assumes a span of three times that length (1,500 ft), but uses a main rib with a weight-strength ratio that is only slightly greater than that of aluminum. This would permit spans equal to, or greater than, any steel arch bridges erected to date.

Norfork Dam in Arkansas Nears Completion

II. *Construction Procedures for Concrete Structure*

By H. V. Pittman, M. Am. Soc. C.E.
Principal Engineer, U.S. Engineer Office, Little Rock, Ark.

Flood waters of the North Fork River, in north-central Arkansas, are controlled by the new Norfork Dam. This project will also provide a substantial amount of electric power. To make this power available for war industries at the earliest possible date, a speed-up program was put into effect which cut several months from the construction schedule. In the summer, crushed ice was used in the concrete mix to prevent temperature cracking. The design of the dam and appurtenances was described by G. R. Schneider in an article in the November issue.

Bids for the construction of Norfork Dam were opened publicly on February 20, 1941. The low bid of $10,778,726 was submitted by the Utah Construction Company and the Morrison-Knudsen Company, Inc., of Ogden, Utah, and Boise, Idaho, respectively, as co-adventurers. Notice to proceed with the work was issued to this organization on April 8, 1941, the time allowed for completion being 1,200 calendar days. However, the original contract was modified by a supplemental agreement providing for an expedited program to permit the early development of power. As a result, a speed-up in concrete placement was inaugurated in August 1942, at which time about 400,000 cu yd of concrete, of the total of 1,500,000 cu yd required for the structure, were in place.

A separate contract was awarded to the dam contractors for the construction of a power house with one 35,000-kw generating unit and space for one additional unit. On June 18, 1943, the outlet conduits were closed and the storage of water began. As a result of the expedited program, the power plant began operating on June 18, 1944, several months earlier than would have been possible under the original schedule. The original construction layout and that for the "speed-up" program and power house are shown in Fig. 1.

PRELIMINARY OPERATIONS

For orderly execution of the work, it was necessary to construct certain facilities in advance of contract operations on the dam. This preliminary work included the following:

1. Construction of a combination office and field laboratory building and a garage, together with water supply, electric power, and sanitary facilities, for use by Government supervisory personnel engaged on the project. These facilities, constructed by Government hired labor, were located near the dam (Fig. 1).

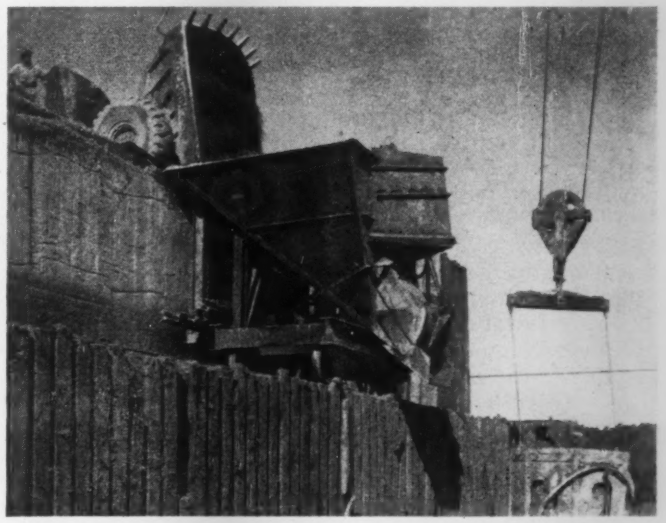
2. Construction of a Government village for the accommodation of key Government personnel with families. This construction was necessary as adequate housing facilities were not available in the vicinity of the project. The village was located adjacent to the town of Mountain Home, Ark., about 13 miles from the dam site, where a good water supply, electricity, schools, and other conveniences were available. This location had the additional advantage that the facilities might later be used conveniently during the construction of other proposed projects in the vicinity of Mountain Home. The village includes 6-room and 5-room dwellings and 4-room duplex apartments, providing accommodations for 48 families. This work was done under contract.

3. Construction of an access road 3.6 miles long and a construction railroad 4.6 miles long. The road and railroad extended from the dam site to points near Norfork, Ark., where they connected with State Highway No. 5 and the Missouri Pacific Railroad, respectively. They made possible the necessary truck and automobile traffic and the rail delivery of about two million tons of construction materials, chiefly concrete aggregates from the White River, but also much heavy equipment for the power house and dam and other supplies. These facilities were constructed under separate contracts.

The plan for construction of the dam provided for a three-stage river diversion. During the first stage, a cofferdam protected the portion of the work from the location of Monolith 19 (Fig. 1) to the high ground on the right abutment. Second-stage diversion called for a cofferdam connecting with the left abutment, and necessary channel excavation to permit the flow to be diverted over the penstock monoliths, which were constructed to a low elevation during the first-stage diversion. The third stage provided for diversion of the river through 11 outlet conduits in the dam.

SOME DIVERSION PROBLEMS

The "speed-up" program and power house construction made necessary some secondary cofferdams to provide for diversion over two low penstock monoliths, and to protect the power-house and tailrace area. The cofferdam protecting the power-house and tailrace area extended from the downstream end of the right training wall northward to the right bank. During this latter phase of stream diversion the conduits were closed. All cofferdams were built from materials excavated from the foundation area of the dam in combination with earth-



During Speed-Up, Concrete Was Trucked from Mixing Plant to Shuttle Car, Which Filled Cableway Buckets

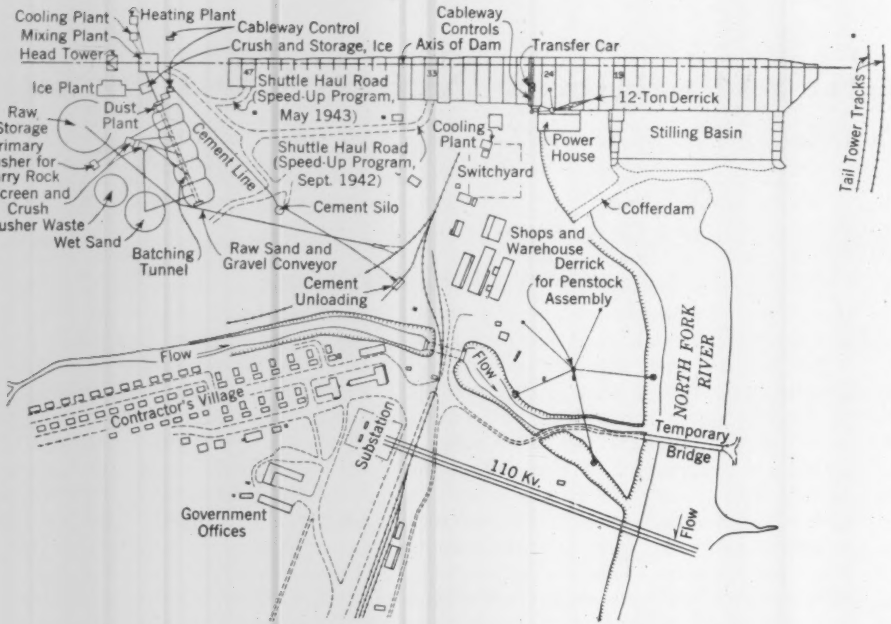

Cooling Plant
Heating Plant
Mixing Plant
Cableway Control
Crush and Storage, Ice
Head Tower
Cableway Controls
Axis of Dam
Transfer Car
Ice Plant
Shuttle Haul Road (Speed-Up Program, May 1943)
12-Ton Derrick
47
33
24
19
Raw Storage
Dust Plant
Primary Crusher for Quarry Rock
Screen and Crush
Crusher Waste
Wet Sand
Cement Line
Shuttle Haul Road (Speed-Up Program, Sept. 1942)
Cooling Plant
Switchyard
Power House
Stilling Basin
Tail Tower Tracks
Cement Silo
Cofferdam
Batching Tunnel
Raw Sand and Gravel Conveyor
Shops and Warehouse
Derrick for Penstock Assembly
Cement Unloading
NORTH FORK RIVER
Flow
Flow
Contractor's Village
Substation
Temporary Bridge
110 Kv.
Government Offices
Flow

FIG. 1. LAYOUT OF CONSTRUCTION PLANT FOR NORFORK DAM

filled cribs, which rested on concrete bases tied in with the permanent work.

Two floods of major proportions occurred, one of about 65,000 cu ft per sec in December 1942, and the other of about 74,000 cu ft per sec in May 1943. These floods caused considerable damage to construction facilities, plant, and equipment and resulted in a loss of about two months of working time. The most serious result was the interruption in the delivery of gravel from the White River, necessitating the procurement of gravel from more distant locations until the facilities for obtaining it nearby could be reinstalled.

FOUNDATION WORK

A total of 486,000 cu yd of common excavation and 438,000 cu yd of rock excavation was required for the dam and power house. This work was performed by jackhammers and wagon-drills, power shovels, draglines, dump trucks, and tractor-drawn carry-alls. Suitable excavated materials were utilized in cofferdams, as backfill and for slope paving.

With but few exceptions, the rock foundation for the dam and power house was sound and tight. A few solution channels, common to limestone formations, were encountered, but these were economically and satisfactorily treated. Core recovery was good and grout consumption low. Drilling and grouting work involved the following quantities:

1. A total of 16,000 lin ft of cored holes drilled for exploratory purposes to obtain additional information on foundation conditions.
2. A total of 55,000 lin ft of cored holes and 14,000 cu ft of grout, required to provide an effective cutoff curtain throughout the length of the dam.
3. A total of 14,000 lin ft of cored holes, drilled to provide adequate relief of uplift pressures throughout the length of the dam.
4. Only a small amount of consolidation grouting, because of the soundness of the foundation rock.

Three types of concrete were used, as follows:

1. Mass interior concrete, proportioned on the basis of 3 bags of cement per cu yd, and 8 gal of water per bag of cement, used throughout the interior mass of the dam, except in certain specified area where richer concrete was employed. Limestone dust was use as an admixture with this concrete
2. Mass exterior concrete, proportioned on the basis of 4 bags o cement per cu yd and 6 gal of wate per bag of cement, placed on th upstream and downstream faces o the dam for a normal depth o about 5 ft, and also around th conduits, water stops, and simila items, and at all other surfaces exposed to weathering or to running water. For lifts in contact with foundation rock, a concrete containing $3^1/_2$ bags of cement per cu yd was employed, and the concrete in gate recesses contained $5^1/_2$ bags of cement per cu yd.
3. A concrete, designated Class "A," proportioned on the basis o $5^1/_2$ bags of cement per cu yd and 5.5 gal of water per bag of cement, for all parts of the power house except the gravity wall, which was constructed of a concrete designated Class "B," proportioned on the basis of 4 bags of cement per cu yd and 6.25 gal of water per bag of cement.

Cements of both low heat and moderate heat of hydration were used, the former during the summer and the latter during the winter. Cement was delivered in hopper-bottom railroad cars to the siding at the foot of the right abutment downstream from the dam, and was unloaded into a receiving hopper located above an air-activated blowing system. This system transferred the cement through a 6-in. pipe line, 1,700 ft long, to the bins of the mixing plant, an operation involving a total lift of about 200 ft. A reserve supply of cement was maintained in a 5,000-bbl silo on the hillside, about 700 ft from the point at which the railroad cars were unloaded. A second air-blowing unit at the silo delivered cement from the reserve supply to the mixing plant (Fig. 1).

Aggregates for concrete were obtained from two sources. Gravel bars along a 20-mile reach of the White River downstream from the dam were an economical source of sand and gravel for the production of aggregates in sizes ranging up to $1^1/_2$ in. in diameter. Materials from these river bars were loaded by draglines into hopper-bottom railroad cars. The loaded cars were transported by the Missouri Pacific Railroad to Norfork, and thence over the construction railroad to the job, a distance of from 10 to 20 miles.

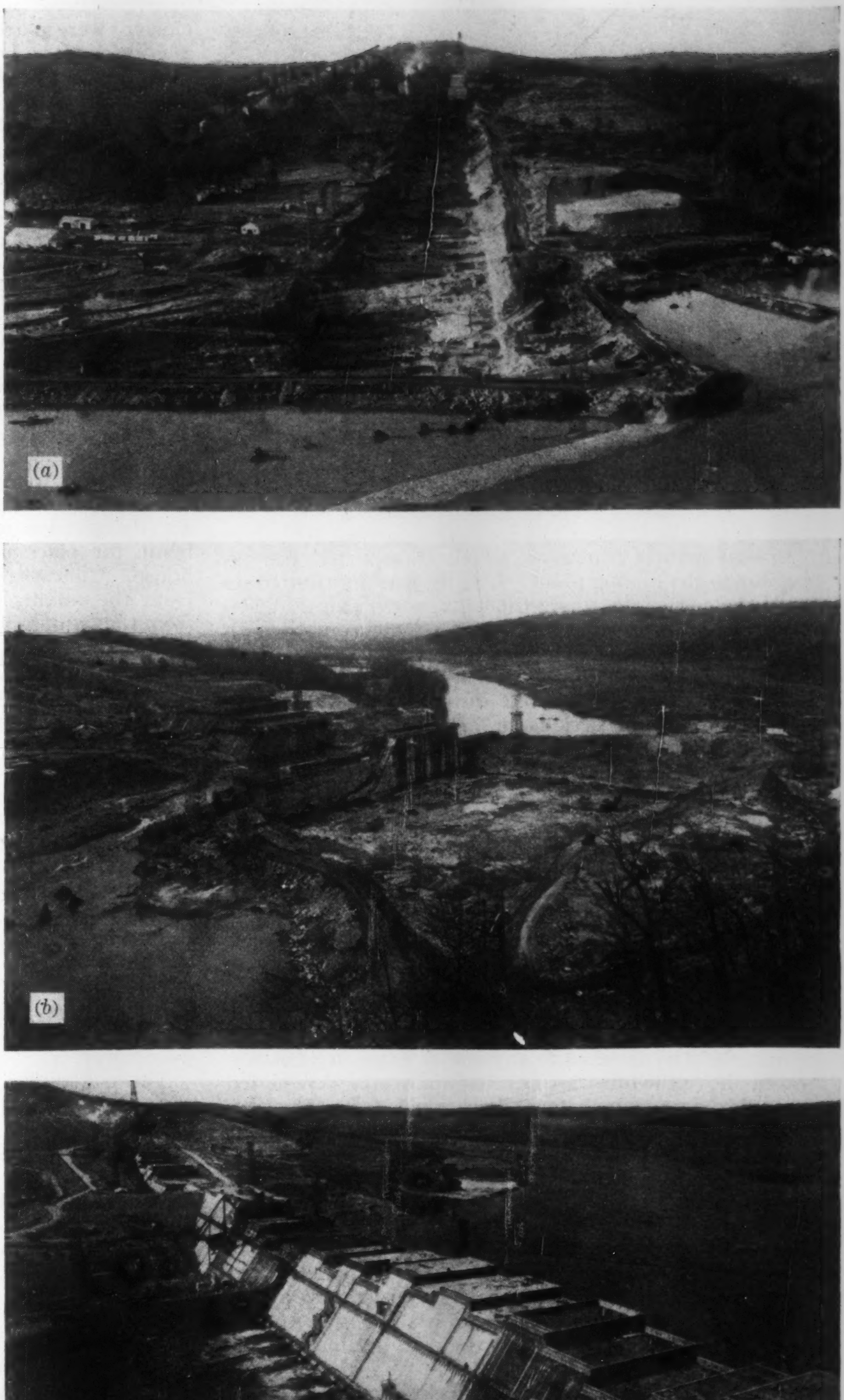
Gravel raw material was dumped from railroad cars into an underground receiving hopper, transported up the right abutment to an elevation 335 ft higher by a 7-flight, 42-in. belt conveyor, 1,352 ft long, and deposited in a raw storage pile over a tunnel $9^1/_2$ ft high by 260 ft long. From this tunnel a 36-in. by 410-ft belt conveyor delivered it to rotary screens. Sand was passed through classifiers to wet sand storage, located above a tunnel 8 ft high by 190 ft long and, after draining, was discharged in this tunnel onto a 36-in. by 260-ft belt conveyor and delivered to dry sand storage above a batching tunnel.

Limestone rock, available in the bluffs above the dam, was an economical source for the larger sizes of coarse aggregate ranging from $1^1/_2$ to 3 in. and from 3 to 6 in. From this rock also was obtained the limestone dust which was added to the concrete to improve workability, minimize segregation, and decrease bleeding tendencies. Rock was obtained from the quarries by churn drilling and blasting. It was then loaded by power shovel into 10-cu yd dump trucks and hauled to the primary crusher, a distance of from $^1/_2$ to $1^1/_2$ miles.

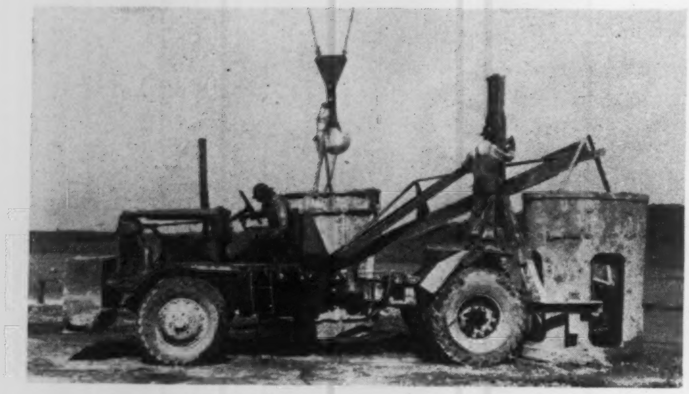
To provide four classes of coarse aggregates, in addition to the fine aggregates and dust, the contractors employed a plant comprising two correlated processing systems, one designed to make $1^1/_2$ to 3-in. and 3 to 6-in. coarse aggregates and rock dust from the quarried limestone, and the other to produce sand and two sizes of coarse aggregates from the gravel bars and from intermediate sizes of limestone rock transferred from the other line. The two systems were interconnected by conveyors, which transferred intermediate-size rock and oversize gravel from one processing line to the other. By means of this coordination, the raw materials were utilized to the greatest extent possible.

Batching of the coarse aggregates, sand, and limestone dust was accomplished in a batching tunnel of oval shape, lined with corrugated steel. Overall dimensions of the tunnel were $13^1/_2$ ft by $10^1/_2$ ft by 459 ft long. Coarse aggregates were stockpiled directly above this tunnel, whereas the sand was wet-stored for drainage before delivery to a stockpile above the tunnel. To produce dust, a ball mill was used to pulverize the limestone, and a bin for storage was so arranged as to feed the dust to the batching tunnel. Feeders and batchers for each size of aggregate were controlled from the mixing plant after the scale beams had been set for the desired weights. Aggregates were transported to the mixing plant by a 42-in. belt conveyor.

Ice was manufactured and crushed in a plant which had a capacity of 140 tons of refrigeration per day. The freezing unit consisted of two freezing tanks, each having a capacity of three hundred and twenty 300-lb cans. The brine race system was employed, each tank containing a Vertiflow unit at one end, the brine being circulated by a vertical agitator. One 8 by 8-in. compressor and two 10 by 10-in. compressors were used. A traveling crane with a 2-can lifting device removed the ice from the freezing tanks. The cans were conveyed to a dipping vat, and thence to a 2-can dump, whence the ice was fed to a chute.



THREE STAGES OF RIVER DIVERSION: (*a*) SITE UNWATERED BY COFFERDAMS FROM MONOLITH 19 TO RIGHT ABUTMENT; (*b*) RIVER FLOWING OVER LOW MONOLITHS 21 TO 23; AND (*c*) OUTLET CONDUITS CARRYING RIVER FLOW



AFTER FLOOD WASHED OUT HAULAGE ROAD, SPECIALLY EQUIPPED TRUCKS CARRIED BUCKETS FROM MIXING PLANT TO CABLEWAY

Ice was moved by gravity to a storage building adjacent to the batching belt. Thence the ice was fed by gravity to a crusher which had a capacity of 500 lb per min. From the crusher the ice was conveyed by a belt to the 42-in. belt conveyor, which transported the aggregates to the mixing plant. The ice was distributed on top of the aggregates along the conveyor. This addition of crushed ice to the aggregates was synchronized with the movement of the belt conveyor by means of signal lights. Refrigerated water, at a temperature of approximately 34 F, was used in the mix along with crushed ice during periods of high ambient temperatures, and also during cooler periods, when crushed ice was not needed.

A plant located near the mixing plant supplied the refrigerated water for the concrete mix and also that for the ice plant. One 8 by 8-in. compressor, which was operated at this plant, provided a capacity of about 68 tons of refrigeration per day. One 100-gal-per-min centrifugal pump moved the refrigerated water to the mixing plant, and another centrifugal pump of 300-gal-per-min capacity pumped water from the condenser to the cooling tower.

After reaching the mixing plant, the aggregates were transferred to a shuttle belt, which moved on a circular arc and could be directed to any one of three dry batches located above the mixers. Cement and water were added when the aggregates were discharged from the dry batchers into the mixers. An autographic recorder, placed in the mixer operator's room, recorded the amounts of each size of aggregate, dust, cement, and water in each batch.

CONCRETE MIXING AND PLACING

Concrete was mixed by three 4-cu yd, 3-blade, tilting-type mixers, each equipped with a consistency meter, which operated on the basis of the shifting center of gravity of the mixer. Normally the mixing time was $2^1/_2$ min for each 4-cu yd batch. After mixing, the concrete was discharged into a chute which directed it to cableway buckets and trucks.

From the beginning of concrete operations, in October 1941, until the inauguration of the "speed-up" program in August 1942, all concrete was transported directly from the mixers to the forms by two 12-ton-capacity cableways. These had a fixed head-tower on the right abutment and two traveling tail-towers on the left abutment, and a span of 2,834 ft, the longest yet used on this type of work. However, upon the initiation of the "speed-up" program, this method of transporting concrete was altered to facilitate placement in the spillway and left abutment monoliths. Monoliths 26 to 33, inclusive, were placed to a common elevation, and a connecting earth and rock-fill dike was built just downstream from the dam to provide a haul road to the mixing plant. Also, a portion of Monolith 25 adjacent to Monolith 26 was left several feet lower than Monolith 26, and a shuttle car was mounted on this portion of Monolith 25 to receive concrete from trucks and deliver it to cableway buckets for placement.

A major flood in May 1943 washed out the dike haul road, and this method of transporting concrete was then abandoned because of the cost of restoring the road. Therefore, in order to continue rapid placement of concrete, a novel arrangement was used. The shuttle car setup was abandoned, and Monoliths Nos. 34 through 48 were placed to a common elevation of 514, and used for direct truck haul of concrete from the mixing plant to the cableways near the center of the dam.

In this arrangement, trucks, each equipped with a steel boom operating from the hydraulic dump jack of the truck, were used to haul the concrete buckets between the mixing plant and the cableways. These trucks also delivered concrete to a stiff-leg derrick with a 180-ft boom for placement in both the dam and the power house. Concrete also was transported by dump trucks from the mixing plant, over a haul road downstream from the dam, to a receiving hopper discharging into concrete buckets for placement in the power house by the stiff-leg derrick. Concrete was placed directly within the forms from 4-cu yd, manually operated, bottom-dump buckets and was vibrated with 2-man electrically operated vibrators.

ABSORPTIVE FORMS

Forms for the dam were of 1 by 6-in. sheathing, nailed over 2 by 6-in., and 3 by 6-in. studding on 12 and 15-in. spacings, covered with absorptive form lining. The lining consisted of an absorptive fiber material, resembling cardboard in appearance, with a special cloth attached to one side. At first the lining was fastened directly to the forms, with the cloth-covered side exposed, by means of small staples driven by a hand-operated stapling gun. However, the wood forms became damaged from re-use, so that re-sheathing and other repairs frequently were necessary.

The contractor then elected to cover the sheathing with plywood and attach the absorptive form lining to that. The use of this lining resulted in a smooth concrete surface of uniform texture and pleasing appearance. This result is particularly noticeable where the lining was used over plywood. The forms were raised for each succeeding lift by steel A-frames equipped with tie-back cables and chain hoists of ratchet-lever type.

The plant used for furnishing refrigerated water to artificially cool the concrete after placement had a capacity of 209 tons of refrigeration per day or, in terms of cooling water, sufficient capacity to reduce the temperature of 500 gal of water per minute from 60 to 50 F. One 7 by 7-in., and one 9 by 9-in., compressor were used in the plant. Two centrifugal pumps, one having a capacity of 350 gal per min and the other a capacity of 150 gal per min, pumped the cooled water to the coils in the concrete. Two centrifugal pumps, one of 600-gal-per-min capacity and the other of 250-gal-per-min capacity, pumped the water from the condenser to the cooling tower. A total of 68 million gal of cooling water was circulated through 360,000 lin ft of pipe.

The Norfork project was constructed under the supervision of the Little Rock Engineer District, U.S. Engineer Department. C. B. Williams was project manager for the contractors for the dam and power house.

Ore and Coal Handling on the Great Lakes

By **A. E. Gibson**

President, The Wellman Engineering Company,
Cleveland, Ohio

Nearly 100 million tons of iron ore are shipped each year down the Great Lakes. This, the greatest inland waterway in the world, links the rich ore deposits in the Lake Superior district to the steel mills of the Midwest. Transportation costs are therefore very low. To unload the enormous tonnage, highly specialized equipment has been developed. Various types of loaders and unloaders are compared by Mr. Gibson in this paper, which was prepared for presentation at the Cleveland Meeting of the Waterways Division.

Of all the many and varied natural resources found in the United States, the huge iron ore deposits of the Northwest have played the greatest part in its industrial development. Through a remarkable coincidence, this vast deposit is situated at the head of the greatest inland waterway in the world, making transportation costs exceedingly low.

The opening of the locks at Sault Ste. Marie marked the real beginning of water transportation of ore down the Lakes. For a period of 11 years following 1855, no mechanical equipment was used in unloading boats. Staging was built in the hold of the ship; the ore was shoveled onto it by hand, and shoveled again from the staging to the deck, where it was reshoveled into wheelbarrows and wheeled onto the dock. Ore cargo boats then had a capacity of about 300 tons and required approximately four days to unload. Today one Hulett unloader can handle that tonnage in something like fifteen to twenty minutes.

The next step was the use of horses hauling a manila rope reaved to the ship's rigging and attached to a tub of ore still shoveled by hand. After being hoisted out of the ship, the ore was wheeled in barrows as before.

In 1867 the first application of mechanical power to unloading resulted from the ingenuity of Robert Wallace, who designed and built a 6-by-12-in. steam engine geared to winding drums. This was a portable rig which could be moved along the dock. The application of power to hoisting permitted the handling of three tubs of ore at one time and cut the unloading time to one day. This method was in general use until 1880. It is estimated that the cost of unloading by this method was 40 to 50 cents a ton.

The next development was the installation of cableways, bridges, and revolving derricks—the latter known as whirlies—equipped with self-dumping buckets for putting ore into cars or on stock piles.

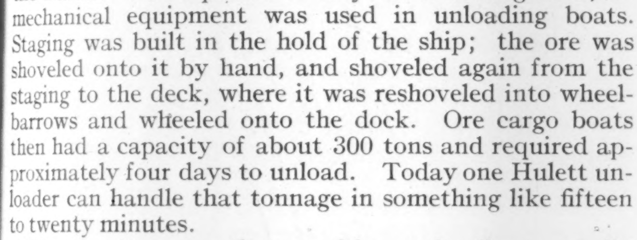
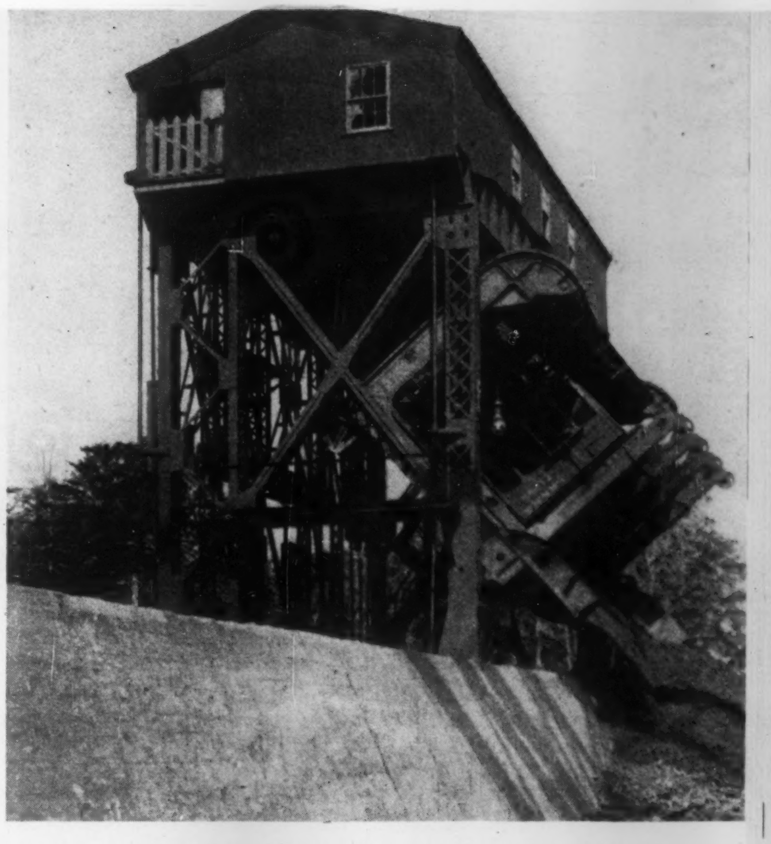


Fig. 1. "Brown Hoist" Cableway—First Rapid Method of Transferring Ore from Ship to Stockpile



Traveling Roll-Over Dumper Used for Storage of Material Where Some Elevation of Car Is Required

In 1880 Alex E. Brown of Cleveland interested himself in the promising ore industry, or at least in that part of it having to do with the unloading of ships. His company, the Brown Hoisting Company, installed three mechanical ore unloaders on the docks of the New York, Pennsylvania and Ohio (later the Erie Railroad) in Cleveland, and these delivered ore from the hold of ships to cars or stock piles without rehandling.

CABLEWAY UNLOADERS

These rigs consisted of two towers, one at the rear of the stock pile, the other on the dock, with a cableway stretched between. A hinged boom attached to the front tower could be lowered, thus carrying the cable over the boat. A trolley, from which a bucket or tub was suspended, traveled on the cable. A 12-by-24-in. steam engine coupled to three clutched drums furnished the motive power for each of the three rigs. The cableway was 383 ft long, 75 ft high at the rear, and 61 ft high at the dock. The height of the operating cable at the dock was 28 ft.

This mechanism, by permitting the carrying of the ore tub out of the ship for loading into cars or onto a stock pile without rehandling, reduced unloading time very materially.

Shortly after Mr. Brown's first venture, Robert Aspin built for the Illinois Steel Company rigs known as the "Champion Hoists." These consisted of a stationary tower supporting a shear leg, which could be raised and lowered to permit a tub of ore to be hoisted from the hold of a ship and brought to the dock so that the ore could be dumped into wheelbarrows or tram-cars. In later rigs the ore was dumped into a hopper with gates, from which it dropped into cars. Unloading with this type of equipment was so efficient that it was not replaced until 1906, at which time new and modern machinery was installed.

THE WORLD'S FASTEST ORE UNLOADING DOCK AT CONNEAUT, OHIO, EQUIPPED WITH HULETT UNLOADERS

Two years after Mr. Aspin's unloading venture at Chicago, another Clevelander entered the field. John McMyler applied the revolving derrick or "whirly," as it was commonly called, to the unloading of ships. These whirleys were a clattering collection of reversing steam engines, clutches, and drums. However, they were fast, and in the hands of an experienced engineer the operating cycle ceased only for the few seconds when the hook was shifted from an empty to a loaded tub in the hold of the ship. A good operator dumped the bucket into the waiting gondola or hopper car "on the run." Even today, where small tonnages are handled, the whirley has survived competition. Those used then were the early vintage of revolving crane now met with so often in industry.

In 1888–1889 ore unloading equipment was revolutionized by two developments. One was the introduction of bridge-type unloaders equipped with clamshell buckets. Previous to this date, ore was still shoveled by hand. The early clamshell buckets were of small capacity, 1 or $1^1/_2$ tons. They were the first mechanical development in the industry which eliminated the hard labor of hand shoveling. Clamshell-bucket handling of ore has continued in use ever since, but capacities of buckets have increased from the original 1 ton to over 23 tons.

STIFF-LEG UNLOADERS

The other development coincident with clamshell-bucket unloading resulted from the invention of the stiff-leg unloader by G. H. Hulett, then with the Webster Camp and Lane Company, of Akron, Ohio (later a division of the Wellman-Seaver-Morgan Company, and now known as the Wellman Engineering Company)

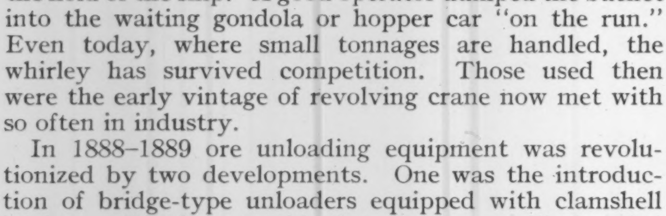


FIG. 2. A 20-TON HULETT ORE UNLOADER

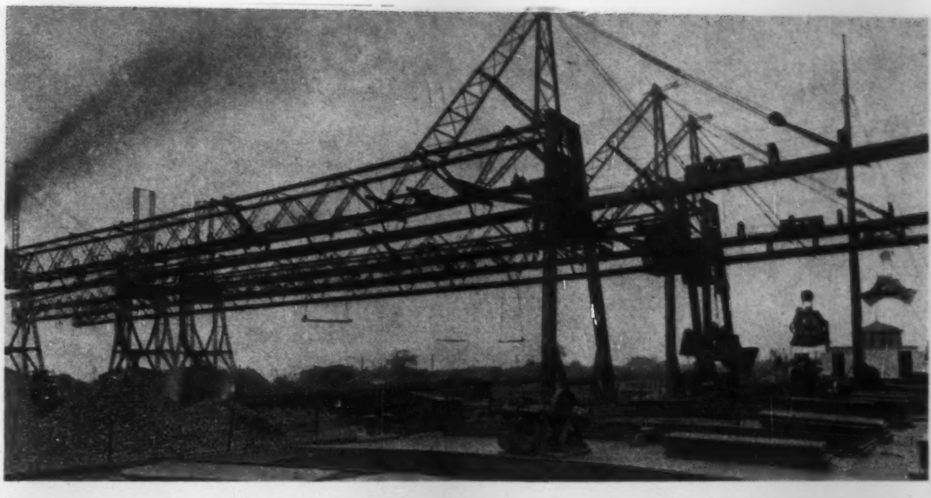
Ignoring all that had gone before, he designed a self-propelled gantry spanning the tracks along the docks, on which was mounted a trolley traveling at right angles to the ship. A walking beam was pivoted at the top and forward end of the trolley. At the water end of the beam, a bucket leg was suspended. The leg extended above the walking beam, and to the top of the leg and to the top of the trolley, a stiffening member was attached. In raising and lowering the bucket leg, a parallelogram formed by the walking beam and leg brace kept the leg in a vertical position. A hopper or larry supported by the main gantry received the ore for loading into cars.

This invention was so revolutionary that it was remarkable Mr. Hulett persuaded any one to buy the first machine. However, this the Pittsburgh and Conneaut Dock Company did in 1898. The first automatic stiff-leg unloader was erected at their dock at Conneaut Harbor, Ohio. It was tested in 1899 and placed in regular service in 1900.

Since the installation of this first machine in 1899, a total of about 66 Huletts have been built. Their capacities have varied from 8, 10, 15, 17, to 20 tons of ore. One machine has a capacity of 8 tons of coal, another one of 20 cu yd of garbage and rubbish. Of these, there are in operation today a total of approximately 40 machines thirty years or more old, and 8 over twenty-five years old. This outstanding service life is the result of sound engineering and efficient operation at the docks. Large tonnages of coal and limestone are unloaded with Huletts at steel plants, and cargoes of pig iron have also been unloaded. While the latter was probably emergency unloading, it is remarkable that pig iron can be picked up by a bucket at all.

During the past two years, outstanding improvements in Huletts have resulted from the cooperation of dock managements and engineers. The benefit of their experience and cooperation was of great value in the re-engineering of new 17-ton Huletts for Chicago and Cleveland, and in the complete new engineering of 20-ton machines for Gary, Indiana, and Lorain, Ohio. The use of hardened tooth gears, alloy steels, anti-friction and swivel bearings, low-alloy steel in highly stressed structural members, increased motor capacity, and larger bucket scoops promises not only increased capacity, but longer life with minimum repairs.

The new 20-ton Huletts at Gary and Lorain were designed not only for the recently built ore boats of 67-ft beam, but for future boats of 70-ft beam. When one of the new boats is docked at Lorain, there will be 24 t of water between the dock and the ship. To span this distance and reach the outboard side of the ship, it was necessary to increase the walking-beam reach from the normal 54 ft to 64 ft. The maximum reach of the bucket beyond the dock is 67 ft. The longer beam and leg brace greatly increased the weight, which is reflected in high wheel loads. This was taken care of by increasing the number of main travel trucks and by using double rails of wide face on the girders, and double-tread, universally equalized trucks on the trolley.



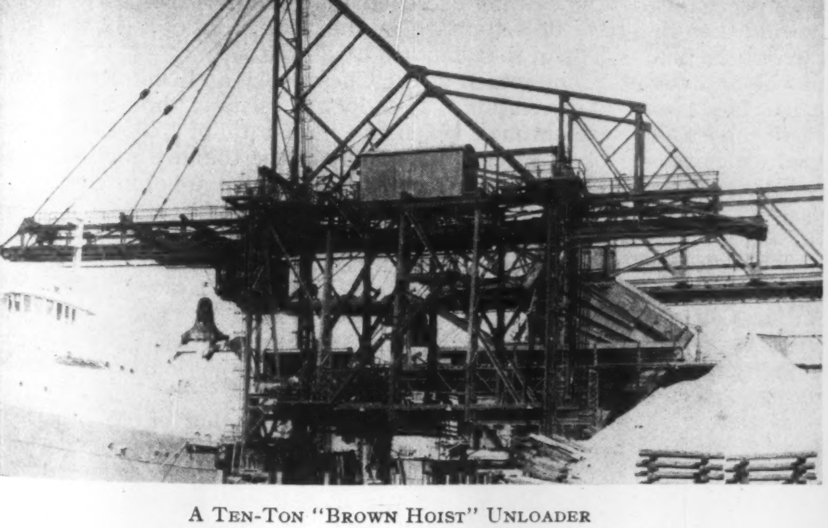
Traveling Bridge Unloader with Some of the Earliest Clamshell Buckets

The question of why the latest design increased the rated capacity of the scoops only from 17 to 20 tons, or 17% plus, may arise. Two conditions were responsible. First, there are in operation today many ore ships of old design, moderate tonnage, and narrow hatches. These boats will be in service for many years. Some of them have 8-ft hatches, which limit the width of bucket scoops. There is a more or less definite relationship between width and depth of scoop; therefore the capacity of buckets is limited by the width of ship hatches.

Second, most new machines are placed on existing docks, many of which are of considerable age and limited carrying capacity. Wheel loads are thus limited, and the number of traveling wheels and trucks supporting an unloader are governed by the center-to-center distance of hatches. However, the increase of three tons in the rated capacity of buckets does not tell the whole story.

A decreased operating cycle, with larger-capacity motors and higher speeds, shorter travel (obtained by moving the receiving hopper forward and down), fewer delays from breakdowns as a result of using better materials both mechanically and electrically—all these factors will, we are sure, materially increase the overall average capacity per hour. Then, too, the increased reach of the new machines reduces the clean-up time, a particularly troublesome matter now on account of the shortage of labor.

The docks at Conneaut, Ohio, have the reputation of being the fastest and most efficient on the Lakes. Their record of ore unloaded per Hulett machine per hour exceeds that of any other plant. As representative, the record of one lower Lake dock having four Hulett machines over thirty years old is interesting. In the 32 years of its existence, this dock has unloaded 120,834,647 gross tons of ore. This amounts to 944,000 gross tons per year per machine. The all-time record of this plant was made on November 16, 1943, in unloading the *SS Col. J. Pickands* with 11,680 Vessel Bill of Lading gross tons in three hours and fifteen minutes, or an average of 898.5 gross tons per hour per machine, and a dock average for the four machines of 3,594 tons per hour.



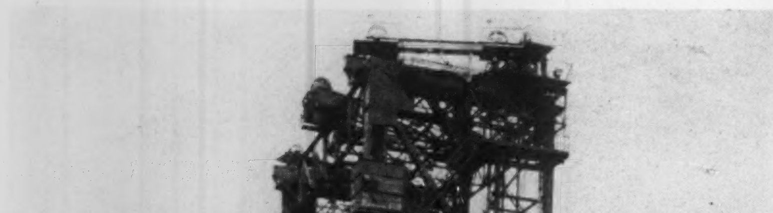
A Ten-Ton "Brown Hoist" Unloader

On the Great Lakes a considerable number of bridge-type unloaders are used, in some instances because the quantity of ore handled is small and in others, notably by the Inland Steel Company at Indiana Harbor, because of preference. At the latter plant, modern clamshell buckets rated at 15 tons, but actually of larger capacity, are in use and the record of the dock is very good. There are other situations where the dock layout will not permit installation of such wide-span machines as Hulett unloaders, notably at the South Chicago docks.

CHOICE OF EQUIPMENT

Generally, the choice of equipment is predicated on the tonnage to be handled, cost of unloading, and capital investment. Bridge-type unloaders are much the cheaper type of equipment. The main difficulty with bridges having rope-operated clamshell buckets lies in the difficulty of keeping the bucket from turning when being raised or lowered through the hatch. When a clamshell bucket picks up its load of ore, it is generally necessary to raise it off the cargo and let it come to rest in the hold of the ship before hoisting. This naturally consumes time and offsets the higher traveling speed over stiff-leg unloaders.

In late years, the main advance in bridge-type unloaders has been in the design and construction of buckets. The new low-alloy steels of 45,000 to 60,000-lb yield and 70,000 to 90,000-lb ultimate strength have played an important part in their development. These materials, fabricated by welding and thermal stress relief, have made possible the building of buckets with long life, exceedingly low upkeep cost, and low weight per ton of ore handled. We have records of ore buckets that have handled many millions of tons



HIGH-LIFT CAR DUMPER AT TOLEDO, OHIO, HANDLES 120-TON CARS

of ore without repairs except that the manganese trays have been moved nearer together after wear.

The loading of coal into ships at the lower Lake docks has a background very similar to the unloading of ore boats. The boat shipment of coal up the Lake dates back to 1850. The first cargo came to Cleveland from the Mahoning Valley in canal boats, was unloaded by hand into wheelbarrows and stored on the dock, whence it was rehandled into wheelbarrows and dumped into the hatch of the boat. This was the reversal of the earliest operation of unloading ore from ships at lower Lake docks.

Later the development of coal handling progressed to the use of whirleys with 1-ton tubs, which were in use from 1875 to 1885. By 1892 the size of the tubs was increased to 5 tons. In 1890 the first car dumper was installed on the Cleveland, Canton and Southern Railway docks at Cleveland for handling coal cars of 10 to 20-ton capacity.

CAR DUMPERS

The first lifting car dumper was installed in 1896 and was highly successful. The operation of such dumpers consists of pushing a loaded car onto a cradle, where it is held to the rails by heavy clamps which press against the top of the car. The cradle is elevated and then inverted so that the coal runs out of the car onto a pan, from which it flows by gravity into a chute which directs it into the hold of the ship. After the car has been dumped, the cradle is brought back to its vertical position and lowered to the starting point. The coal car is then bumped out of the cradle by the next incoming loaded car and the empty car runs down the discharge track into the empty storage yard.

The modern high-lift car dumper follows closely the original design. Originally, they were steam machines and many such are still in operation. The first electrically operated dumper was installed at Baltimore in 1921 at the Western Maryland Railway Company. This was a Wellman development. In 1926 the first electrically operated high-lift dumper on the Lakes was installed at Toledo for the Ohio Central Railway Company. The cradle and mule-car motions employ electric control and the cradle is over-counterbalanced so that the power required to raise the loaded car is approximately the same as that needed to lower the empty one. The Toledo dumper and those that followed were designed to handle 120-ton cars at the rate of 40 per hour. When loaded these cars weigh 160 tons, and when light about 40 tons. The current used per ton of coal in 70-ton cars after installation of the dumper was only 0.24 kwhr.

Improvements in car dumpers to lessen the degradation of coal have resulted from the developments carried on simultaneously but separately by the Industrial Brown Hoist Company and the Wellman Engineering Company. The flow of coal from the car is retarded by lowering a series of plate covers onto the top of the car, thus preventing the catapulting of lumps of coal onto the platen during dumping. As the cradle revolves, the hinged covers slowly swing forward, permitting the coal to flow onto the pan. The pan and telescopic chute for directing the coal into the ships' hold are not allowed to become completely empty. This, too, retards the flow and prevents degradation. Laying of coal dust and a predetermined moisture content are achieved by spraying on water as the coal leaves the car.

Revolving and turnover types of car dumpers have won wide acceptance where ore and coal of considerable tonnage are used industrially. The former is simply a rotating cylinder having a platen with rails which aline with the railroad track. The car is pushed onto the platen. As the cylindrical dumper revolves on supporting rollers, automatic counterweight-operated clamps are pressed against the top of the car, holding it to the rails. As the dumper revolves, the material runs out of the car, generally into a hopper, from which it is carried by conveyors to the desired location.

The turnover dumper is similar to the high-lift dumper except that the cradle is not elevated but rotated around a fixed pivot. This type of dumper provides higher elevation of the car when dumping than does a revolving dumper, but less elevation than a high-lift dumper. The turnover dumper is naturally more costly than the revolving type, but the cost of both is much smaller than that of the high-lift machine. Turnover dumpers are of the traveling as well as of the stationary type. The traveling dumper is used mainly where material is to be spread along a storage pile.

Of the 46 million and 47 million tons of coal handled at Lake Erie ports in 1943 and 1942 respectively, Toledo's tonnage far exceeded that of any other port. In fact, Toledo's tonnage in the peak year of 1942 was nearly 50% of that handled by all ports.

The record of the Chesapeake and Ohio Railway dock is interesting. This dock consists of three lifting dumpers, through which in 1942 a total of 15,654,717 net tons of coal were put. In 1943 the tonnage was 14,858,101. The following records of operation are of interest:

Day record	Apr. 29, 1942	1,957 cars	114,333 tons
Month record	Oct. 1943	37,667 cars	2,180,492 tons
Year record	1942	265,231 cars	15,654,717 tons

This means that on April 29, 1942, one car was dumped every 44 sec during the 24-hour period, and in October 1943, one car was dumped every 71 sec.

Unloading of ore boats and loading of coal in ships has reached a high degree of efficiency. Future developments and refinements in present methods and equipment will probably not greatly increase production. However, a future Alex Brown or a G. H. Hulett may some day again revolutionize methods of handling ore and coal.

Timber Hangar Erected from 16-Story Scaffold

By C. G. CAPPEL, M. AM. SOC. C.E.

W. HORACE WILLIAMS COMPANY, NEW ORLEANS, LA.

AT Houma, La., a huge timber hangar has been built by the Navy to house its lighter-than-air craft. Dimensions of this structure are considerable. In round figures it is 300 ft wide, 1,000 ft long, and 180 ft high. Along each side are shops, offices, and other facilities, located within the concrete A-frames which support the timber arches.

The structure is founded on untreated wood piling, cut off below the water table and capped with concrete footings. On top of these footings are concrete A-frames having the inner leg vertical, the outer leg battered to the slope of the timber arches above. The height of the A-frames is approximately 25 ft and they are about 30 ft wide at the bottom and 20 ft wide at the top. From their tops spring wooden truss arches. The panels in the arches are approximately 20 ft wide and the depth of the arches is about 13 ft.

This composite bay, then, of concrete footings, concrete A-frames, and wooden arch trusses, constitutes a complete unit and is spaced 20 ft on centers. Adjacent bays are connected with bracing and purlins, the rafters running in the same direction as the arches.

Sheathing of 2-in. tongue-and-groove lumber covers the rafters and is in turn covered by composition rolled roofing. All timber connections were made with timber rings or shear plates, as the case might be. The rings were used where assembly was done piece by piece. The shear plates were used to connect preassembled units.

The problem was how to erect the structure. Pile driving presented no particular problem as this is a usual operation in this section. The construction of the concrete A-frames presented no problem except that of extreme accuracy of erection. The real problem started at the top of the A-frames. After a study of the composition of the arches and other members, various methods of erection were analyzed, starting with preassembly in one piece and running the full gamut to erection piece by piece. Preassembly and erection in one piece offered many obvious difficulties and very few advantages.

If the unit was assembled in a flat position it would then have to be picked up through a rise of some 130 ft. If, on the other hand, the unit was in a vertical position, the gain in height would be only that of the A-frames—or 25 ft.

Pre-assembly in two pieces entailed practically the same difficulties to a lesser degree. Pre-assembly in four pieces was considered, but abandoned for a number of reasons, not least among which was the amount and type of equipment required, and the fact that three connections would have to be made in the air. Ordinarily these would not be difficult with a steel structure, but they presented considerable difficulty in a timber one.

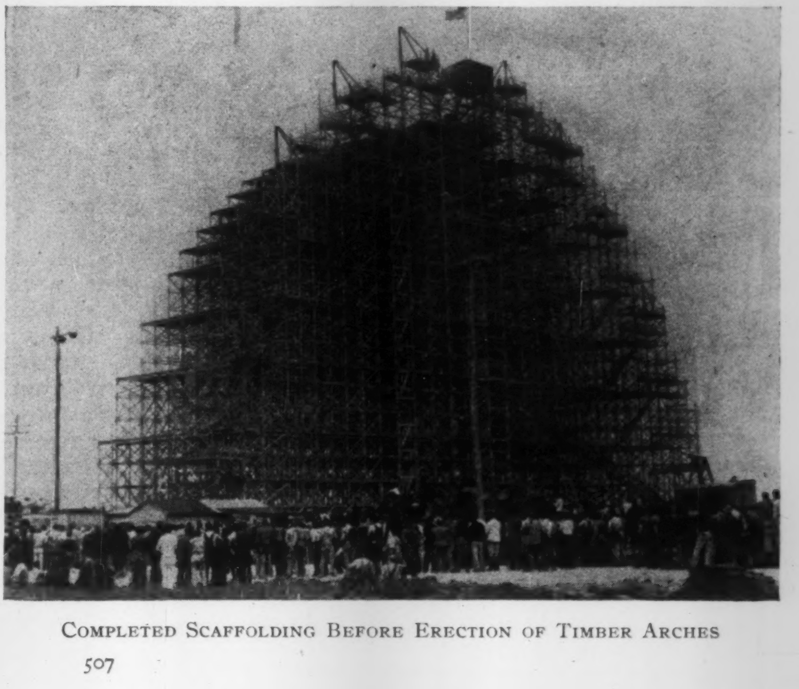
Pre-assembly in any large units would entail deformations during erection, and since the greatest possible accuracy was desirable, in a structure of this size cumulative errors of erection might cause difficulties not only in the way of alinement but also possibly in subsequent stresses. For these reasons, erection piece by piece in the air was finally considered. The required equipment was simple, inexpensive and light. The total labor, apparently, was less than for any of the other methods analyzed.

It then became necessary to devise a means of accomplishing this piece-by-piece erection, which would allow the men to work as nearly as possible under ground conditions, to give the utmost of accuracy and control, speed of operation, and economy in both time and money. A moving scaffold which would provide a working platform 3 ft below each panel point fulfilled this need. These working platforms, having the usual hand rails and other safety devices, provided working conditions approximating those found in working from the floor to the ceiling of a room. Several men fell during the erection of the hangar, but the platforms saved them all. There were no fatal accidents and very few accidents of any kind.

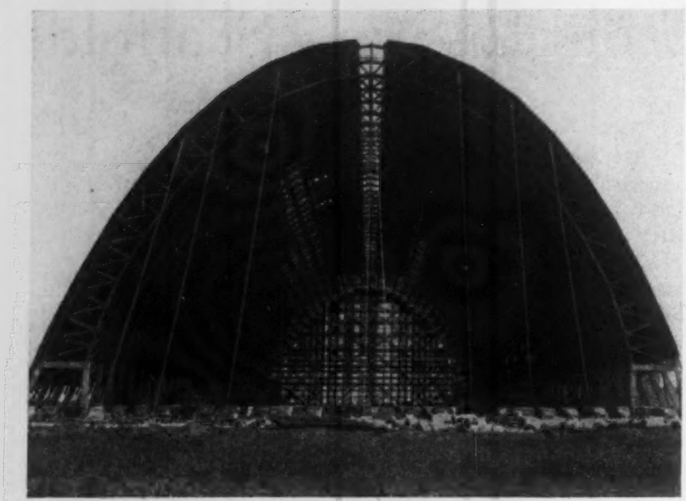
DESIGN OF SCAFFOLD

Loads on the scaffold were very light, and an analysis showed that 4-by-4 timbers would take all direct loads provided they were stayed at proper intervals so that the allowable value of L/R would not be exceeded. Generally, then, the scaffolding was built of 4-by-4 uprights and 2-by-4 bracing, the latter being of the ribbon type, mostly intended to distribute the load equally over the 19 sills supporting the scaffold. The first or front bay was extended up beyond the upper chord so as to provide on the back side of the bay a vertical template against which the arches could be assembled in exact position.

The first two bents had 6-by-6 uprights, and on top of this first bay 8 small stiff-leg derricks were mounted—each with a 20-ft boom. This gave a spread covering the entire span of the arch. The load line of the derricks was handled by a small air hoist having a 2,000-lb line pull. The boom was handled by hand crab and the swinging of the boom by bullstick. With eight of these units in service, eight crews could be working at once.



COMPLETED SCAFFOLDING BEFORE ERECTION OF TIMBER ARCHES



HANGAR NEARING COMPLETION—END CLOSURE NET STARTED AT TIME OF THIS PHOTOGRAPH

Air compressors were mounted on the scaffold. In the center of the front bay an electric freight elevator was installed which transported men and small materials to the various platforms. This was a great saving in time and money, as it is evident that a man would expend much effort just in climbing up and down 160 ft a few times a day.

Coming on down, then, to the support and running gear, the uprights were founded on a 10-by-12 timber which rested on 7-in. hardwood rollers, made up in dollies with 2-by-10 sides, so as to guide them and keep them straight. These dollies in turn traveled on 10-by-12 run timbers laid perfectly level.

At about 15-in. intervals in this run timber, $1^{1}/_{2}$-in. pipe was set through at about the center. On the rear a bucking block was held down to the run timber by bent pins in the pipe inserted in the run timber. Between the bucking block and the seal or base of the scaffold proper, a 15-ton track jack was placed. There were 19 of these run timbers, and therefore 19 jacks. Timber for the arches and all structural framing was furnished cut to size and drilled for bolts and rings. An excellent job was done by the suppliers.

LOWER SECTIONS PLACED

It was finally determined before erection commenced, to preassemble about 75 ft of the lower part of the arches, and erect these pieces with cranes traveling outside the hangar area. The preassembled units were put together almost in location and picked up and placed by the cranes, set on top of the A-frames and resting at the upper end against the scaffold.

The reason for erecting the lower 75 ft in preassembled condition was that in this lower stretch the arches are almost vertical and the small derricks serving this stretch would have had several times as much work to do as those farther toward the crown of the arch. Also, the difficulty of supporting this nearly vertical section on scaffolding was considered.

Incidentally, only one crane could be located of sufficient normal capacity to handle this load of about 8 tons at the required distance, so another crane was pressed into service which was really entirely too light for the job and which normally worked with a 65-ft boom. Its boom was extended to 105 ft, and 5 tons of extra counterweight was added on the back. It was then tied down to a caterpillar tractor so that it would not tip over when booming out with the load.

Materials were brought into position directly under the derricks on top of the scaffold, thus providing ready access to the materials without congestion. Since the arches are braced in pairs, it was necessary to erect the first two arches at the same time. Once these two arches were in place, braced, and guyed, operations went along smoothly. The 75-ft lower sections were placed and the other arches assembled piece by piece in place.

A speed of erection of one bay, or 20 ft, per day was planned, and sufficient materials were kept on hand so that this schedule could be maintained.

Work started off at this expected speed, but steadily improved with the experience of the workmen and the ironing out of small difficulties, to the point where $2^{1}/_{2}$ bays a day were being completed.

The scaffold moved smoothly, and for the first quarter of the building the loads were apparently well distributed over the 19 run timbers, according to design. However, after a certain amount of movement, the scaffold began to act as it wanted to, and not as the constructors wanted it to. The loads came straight down without distribution. This was evidenced by the fact that when the work started, the effort needed at each one of the 19 jacks was approximately equal. After erection had progressed some 200 ft, it was found that the jacks at the center of the scaffolding required 4 men, and those toward the outside required progressively less effort, until at the outside one man with one hand could easily operate the jack. This seemed most peculiar at the time, although actually it was a natural and necessary adjustment of the timber structure.

Another peculiarity of the scaffold should be mentioned. It was necessary to keep the run timbers absolutely level. At one time these timbers at diagonally opposite corners got out of level a little over an inch. Because of the resulting shift in weight, the scaffold began to crowd to the low side so heavily that it was necessary to pull it back and re-level the run timbers. As each impulse from the jacks moved the scaffold forward at the rate of about 1 in. a minute, the head of the scaffold swayed about 4 in. During working hours, the front end of the scaffold was free to move, but at quitting time both ends of the run timbers were blocked in so that a wind would not move it. For further safety, it was guyed thoroughly when no work was going on.

When the work had progressed sufficiently, sheathing was started, utilizing a combination of rolling scaffold and fixed scaffold. The fixed scaffold proved to be best for this operation.

The sheathing timbers were passed up to the working area with two cranes, each with booms extended to 140 ft. The rest or top part of the sheathing material was raised by means of cars on rubber tires, pulled over the periphery of the previously roofed section, and running between the working scaffolds. The sheathing operation was quite difficult, although not complicated. The vast amount of material which had to be handled to such a height was the real problem. The rolled roofing was placed in horizontal sections using rolling scaffolds.

From a survey of this erection job, it is concluded that about the only change that would have been an improvement would have been the use of 10 small derricks instead of 8 on the moving scaffold. This would have speeded erection somewhat.

This hangar was designed by the Planning and Design Department of the Navy Bureau of Yards and Docks. The design was described by Arsham Amirikian, M. Am. Soc. C.E., in CIVIL ENGINEERING for October 1943. The W. Horace Williams Company was the principal contractor on the work.

Engineering Aspects of Mosquito Control

III. Program of U. S. Public Health Service to Combat Dengue and Yellow Fevers

By Harvey F. Ludwig, Jun. Am. Soc. C.E.

Assistant Sanitary Engineer, U.S. Public Health Service; Health Division, United Nations Relief and Rehabilitation Administration, Washington, D.C.

Epidemics of dengue fever have occurred in municipalities of the United States as recently as 1941. This and yellow fever are transmitted by a domesticated variety of mosquito called Aedes aegypti. Certain areas of our southern states offer ideal climate for this mosquito, which necessitates continuous vigilance on the part of health officers. To assist these local officers, the U.S. Public Health Service has suggested the control program which Mr. Ludwig describes in this paper, originally presented before a meeting of the California Mosquito Control Association held at Berkeley, Calif.

Little or nothing can be done to assist a person who has contracted either yellow fever or dengue; either disease simply must run its course. Both diseases, however, can be prevented. No outbreak of yellow fever has occurred in the United States since the memorable New Orleans epidemic of 1905. The absence of epidemics since then has been attributed principally to improved quarantine measures combined with the subsidence of the disease abroad. This very absence of yellow fever for almost forty years has greatly increased the percentage of people in this country who are not immune, and it is fortunate that an effective yellow fever vaccine has been since developed. Large supplies of this vaccine are held by the Public Health Service for emergency use, and it is possible at the present time to immunize entire municipal populations within a few days.

No such prophylactic vaccine has been developed for dengue fever, and further, immunity acquired through an attack of dengue is only temporary, probably lasting a year at best. The control of the *Aedes aegypti* mosquito remains the only effective means for preventing the spread of dengue fever.

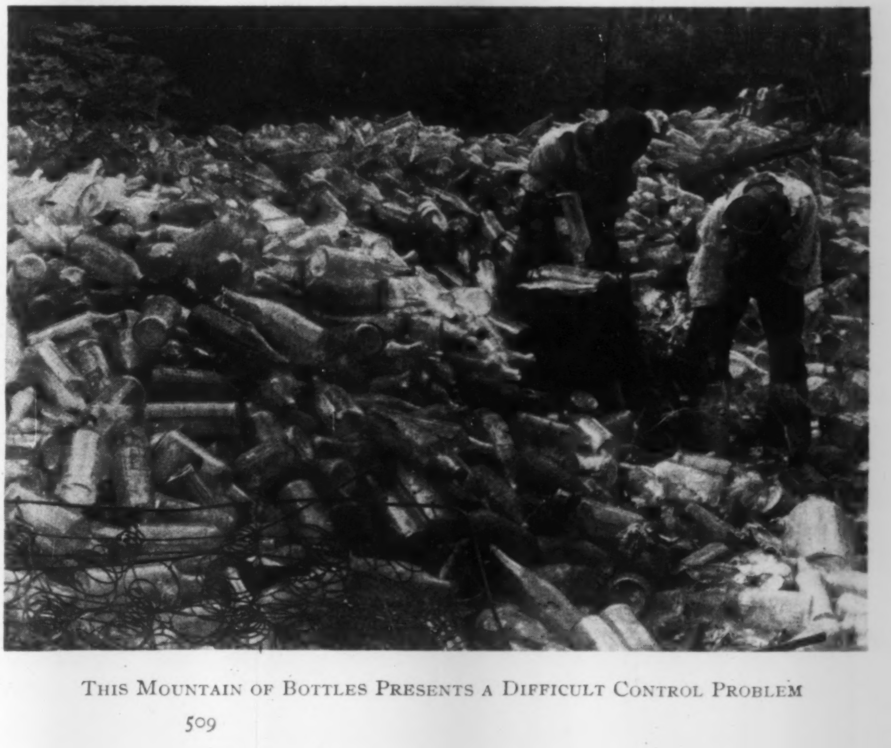
Dengue fever, commonly called "breakbone fever," has a world-wide distribution in tropical regions, but in the United States its occurrence has been limited chiefly to the Gulf and South Atlantic coastal regions, principally Texas, Louisiana, Alabama, and Florida. For example, large epidemics occurred in Texas in 1897, 1907, 1908, 1912, 1918, and 1922. It has been reported that approximately two-thirds of the populations of Houston and Galveston were affected in 1922, and the total for the state was almost a million. Another severe outbreak occurred in 1934 in Florida and Georgia, particularly in the Miami area, which reported about 10,000 cases. Again, in 1941 about 2,000 cases were estimated to have occurred in the Rio Grande Valley of Texas. All the evidence indicates that such severe epidemics are likely to occur again. As in the case of malaria, dengue can spread from a few initial cases to epidemic proportions only when sufficient mosquito vectors are present in the community.

To combat the hazard of outbreaks of yellow fever and dengue, the U.S. Public Health Service since 1941 has operated an emergency program for control of the *Aedes aegypti* mosquito. This species, the only vector of yellow fever and dengue known to be present in this country, is prevalent throughout the Gulf and South Atlantic coastal regions. The greatly increased volume of war-connected foreign travel, particularly by air, has intensified the epidemic hazard, so that active stimulation and participation by the federal government in controlling the species has become essential. This activity has been established within the Public Health Service's Office of Malaria Control in War Areas, in Atlanta, Ga., and is operated through, and with the cooperation of, state and local health departments.

At present, *aegypti* control units are being operated in the United States in eleven selected war-important cities or urban areas along the South Atlantic and Gulf coasts, from Charleston, S.C., south to Key West, Fla., and west to the lower Rio Grande Valley in Texas. A twelfth unit has been operated in the Hawaiian Islands since the beginning of the Honolulu dengue epidemic in 1943.

CHARACTERISTICS OF THE MOSQUITO RESPONSIBLE FOR DENGUE AND YELLOW FEVERS

This species, *Aedes aegypti*, formerly known as *Stegomyia fasciatus*, is one of the most domesticated of all mosquitoes, and greatly prefers human blood to that of other animals. It flourishes in climates of relatively



This Mountain of Bottles Presents a Difficult Control Problem

COLLECTING TOP-FEEDING MINNOWS TO STOCK TANKS, PONDS, AND CISTERNS

high temperature and humidity. Its entomological characteristics may be summarized as follows:

The adults are small and dark, with a silvery lyre-like marking on the thorax and snowy white bands on the legs. The females are wary biters, and are especially annoying about the ankles.

Although it travels readily on trains, automobiles, etc., its flight range is limited to about 200 yards, or generally not more than a city block.

It breeds almost exclusively in artificial water-containers in the vicinity of dwellings or in the dwellings themselves (Fig. 1). Fairly clear but not necessarily clean water is preferred.

Its eggs are laid on the sides of the receptacle just above the water-line, or on the surface of the water. The eggs are able to withstand considerable drying, and hatch out quickly when wet.

Wooden receptacles are preferred for oviposition; next in order of preference are masonry, earthenware, and metal.

Both eggs and larvae can survive considerable cold weather, or even short exposure to freezing temperatures, but continued cold destroys most eggs and probably many larvae.

Important breeding places for *aegypti* inside the home are water-plants, unused toilet bowls and tanks, unused ice-box drip pans, and storage places for drinking water. Outside the home the principal sources are tubs, buckets, pans, wide-mouth jars, barrels, automobile tires, tin cans, and clogged or sagging roof-gutters. House cisterns are of great importance wherever numerous.

The receptacles of greatest importance are those of permanent and semi-permanent nature which are sufficiently protected from winter weather to permit propagation the year round, and these have been termed "mother foci" since they are largely responsible for "seeding" the much more numerous temporary containers with the beginning of warm weather. This relationship has given rise to the opinion that an anti-*aegypti* campaign should begin with a concerted effort on the mother foci with relatively little initial attention to temporary containers, rather than by simultaneous attack on every possible breeding place in the community.

Inasmuch as *Culex* mosquitoes readily breed in all the receptacles suitable to *aegypti*, anti-*aegypti* measures will simultaneously destroy a large number of the other domestic mosquitoes. From the point of view of public relations, it is often desirable to supplement measures against *aegypti* with some work directed almost entirely against *Culex*, such as the larviciding of ditches, ground pools, and catch basins.

THE CONTROL PROGRAM

Experience in South America, and our own operations in Key West, Fla., in 1942-1943 have demonstrated that in previously unworked areas absolute control of *aegypti* mosquito breeding during the rainy season can be accomplished only with large-size organizations, with perhaps a minimum of one worker per thousand of population protected. The *aegypti* control units now operated by Malaria Control in War Areas (see article by Mark D. Hollis, "Malaria Control in War Areas," November 1944 issue, p. 467) average only about one-tenth of this ratio. These small-scale organizations are operated in only a few of the cities normally infested with *aegypti*. Obviously the objective of our control program is not complete control and eradication of the species, but rather the establishment of units which can be immediately expanded in the event of epidemics, plus the securing of a measure of control in the most important war-connected areas sufficient to prevent the occurrence of explosive epidemics.

It is believed that, unless measures are taken to suppress *Aedes aegypti* by inspectional and educational means prior to the outbreak of an epidemic, the machinery of

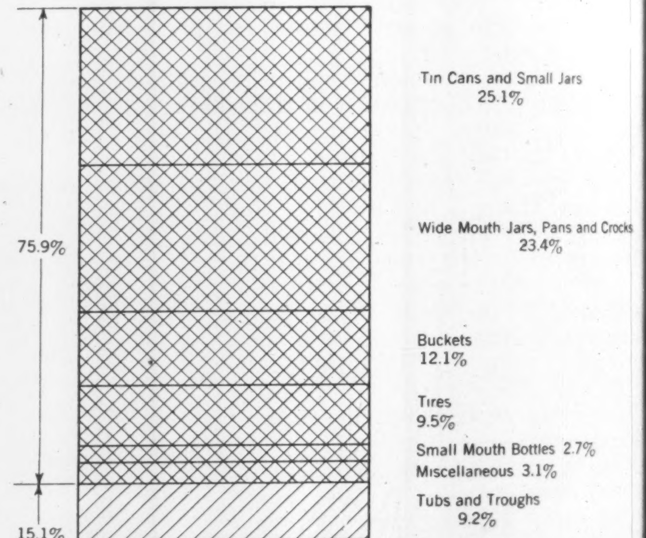
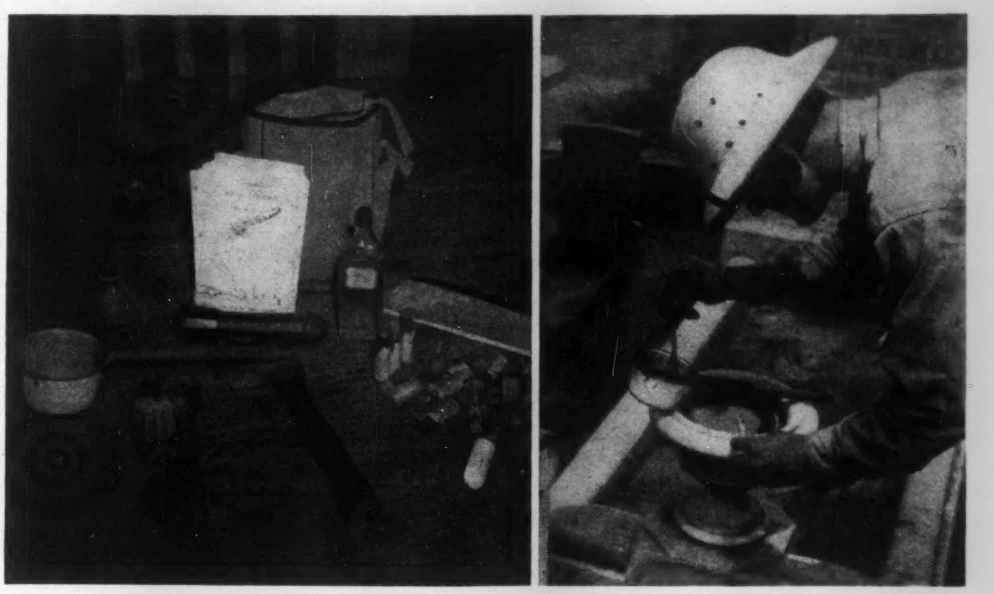


FIG. 1. DISTRIBUTION OF AEDES AEGYPTI LARVAE FOUND IN VARIOUS TYPES OF CONTAINERS DURING THE 1943 SUMMER

suppression cannot be set in motion in time to prevent the development of hundreds or thousands of cases.

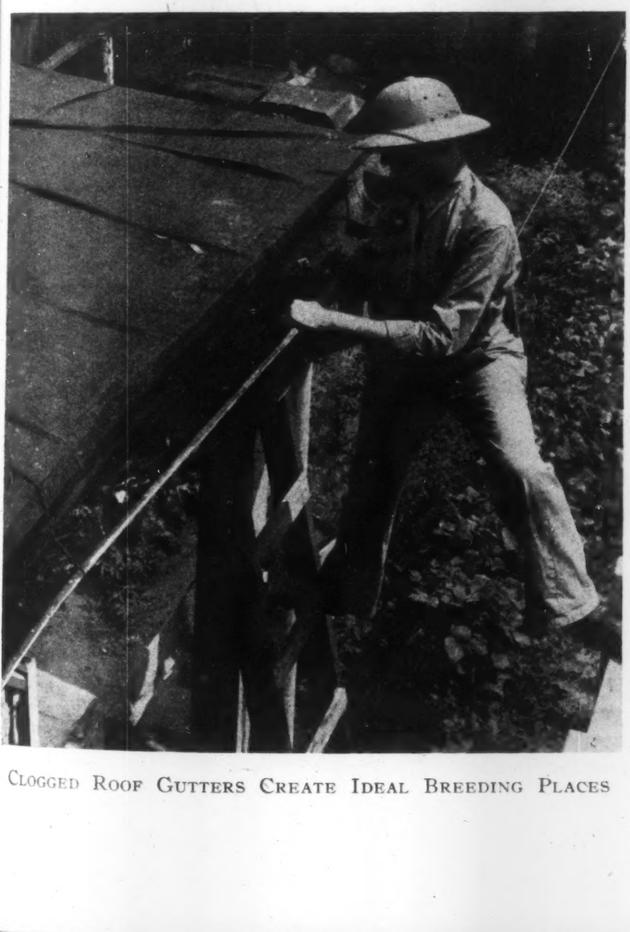
The various purposes and objectives of the program are stated in detail in the following outline:



Kit of the Aegypti Inspector, Left; and Finding Larvae in a Cemetery Urn, Right

A. To prepare for immediate control of possible epidemics of yellow fever and dengue through the following measures:

1. Operating small-scale *aegtypti* control projects at strategic and war-important cities, thus making available a nucleus of personnel trained in control methods, which could be readily expanded in time of emergency and readily moved to other locations if necessary.
2. Collection in project (and other war-important) cities of physical data pertinent to epidemic control (such as the locations of cisterns, fire-barrels and areas of high breeding indices), and the analysis, tabulation, and mapping of these data to make them readily usable.
3. Permanent elimination at project cities of important *aegypti* breeding foci; for example, by filling cisterns, and by bringing about cooperative community action such as improved can collections.
4. Headquarters activities supplementing the preceding field measures, as follows:
    - (*a*) Preparation of educational training films, manuals, and bulletins designed for rapid training of new inspectors and for instructing volunteer workers.
    - (*b*) Maintaining supplies and equipment which would be needed for epidemic control, including mobile truck units completely equipped with stocks of larvicides, insecticides, and insecticide applicators.
    - (*c*) Preparation of plans for immediate establishment of epidemic control administrations in war-important cities, considering all interested agencies—federal, state, and local.



Clogged Roof Gutters Create Ideal Breeding Places

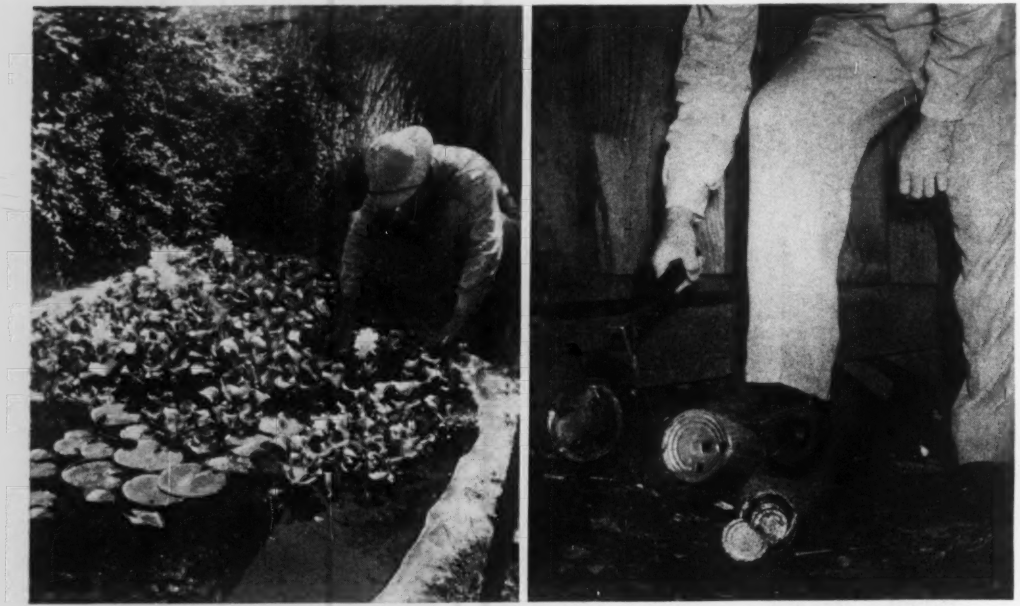
B. To effect as much actual wartime control of *aegypti* breeding in the project cities as can be accomplished with the limited means available, in other words, to attempt to maintain the *aegypti* population below the level at which real danger of epidemics of dengue and yellow fever exists, utilizing all known control methods.

C. To conduct an educational campaign designed to gain the permanent cooperation of the housewife in keeping her own home and yard free of water-containing receptacles:

1. In project cities this is accomplished primarily and incidentally through the personal contacts made regularly by the field inspectors during their routine inspection of premises. Other supplemental publicity methods are employed, including the newspapers, radio, movies, schools, and distribution of bulletins by cooperative agencies. These supplemental measures are important, but are of less permanent value than the inspector's personal visits.
2. In non-project, war-important cities, bulletins are being distributed and explained to householders through the assistance of cooperative agencies such as the OCD Block Leaders and the schools.

D. To demonstrate the feasibility and economy of the small-scale program and thus encourage its permanent adoption by local health units.

The staff of each field unit generally comprises a supervisor, an assistant supervisor (for the larger projects), an inspection staff of sub-professional employees, in



LEFT, INSPECTOR CHECKING A BACKYARD LILY POND FOR MOSQUITO LARVAE, AND RIGHT, CANS BEING PUNCHED FOR DRAINAGE

some cases a small number of laborers, and some stenographic assistance. Office and storage space for all projects has been provided by the local health departments. Operations are logically seasonal, and are divided into "summer activities," carried on during the active breeding season, lasting about eight months, and "winter activities" for the remainder of the year.

SEASONAL ACTIVITIES

Summer activities may be classified in relative order of importance as follows:

1. Routine inspection of premises in essentially residential areas to locate and correct places of breeding or potential places of breeding, both outside and inside the house.
2. Special field inspection work in pertinent nonresidential areas, as in warehouses, cemeteries, military zones, junk yards, office buildings, and harbor areas.
3. Service calls, such as stocking cisterns and tanks with *Gambusia* (surface feeding minnows), removing can-collections and barrels, insecticide spraying of homes to kill adult mosquitoes, and other work which cannot be performed by the inspectors during their routine visits or which may be specially requested by residents.
4. Special educational activities, including the use of newspapers, radio, cooperative agencies, theaters, and schools, designed to supplement the inspector's efforts to enlist the cooperative support of the housewives.

The frequency of inspection of premises actually obtained in the various projects is two months or more; whereas for complete control and eventual eradication, the inspection cycle should not exceed the optimum breeding cycle, or 10 days to two weeks. The degree of success of the program obviously will depend largely upon the extent of the housewife's cooperation, that is, in inspecting her own home and yard in the period between the inspector's visits.

During the winter season, when outdoor breeding has been practically eliminated by cold weather, emphasis is shifted from routine inspection to the correction of permanent foci of breeding, such as cisterns (which may be screened, capped, destroyed, or otherwise treated), warehouse fire-barrels (which may be placed on a permanent larviciding schedule conducted by the warehouse manager), and water plants inside homes (which may be potted in earth). The winter period also affords an opportunity for the compiling and preparation of permanent records and maps, and for the tedious planning essential for an active program the next summer.

Equipment needed by the inspector for work on residential premises includes a carrying kit (either knapsack or satchel type) with some or all of the following: suitable larvicides (kerosene, phenothiazine, paris green) in proper containers or applicators; flashlight and mirror; report booklet and blank forms; dipper, pipette, and larvae specimen bottles; pointed hammer for punching tin cans; chalk; and a supply of printed "premise bulletin" educational leaflets. Inspectors carry proper identification cards and sometimes local health department badges, and are dressed alike in a non-military khaki uniform. The premise bulletin is of considerable value in helping the inspector to gain the housewife's approval to inspect the house and yard, and provides her with both educational material and the address of the local *aegypti* control unit. The inspector's routine includes the following activities: examining the premises, talking with the housewife, recording and correcting containers found holding water and those likely to catch rainwater, taking larvae specimens from containers, and reporting breeding places or potential breeding places which he cannot correct himself.

For the special field inspection and for the service work, additional equipment is required, including means for obtaining, storing, and delivering the larvae-eating fish; hand dusters and sprayers for large-scale larviciding; ladders for inspection of roof gutters and aboveground cisterns; insecticide sprayers with supplies of insecticide for killing adult mosquitoes in premises where they are breeding; and so on.

Except in times of epidemic or threatened epidemic, when funds are easily obtained for an "all-out" campaign directed against all places of breeding, anti-*aegypti* programs must be operated on an economical basis commensurate with other health department activities. In normal times, it may seem desirable therefore to limit activities to measures just sufficient to keep the *aegypti* density at a safe level. The mosquito lore of this species has been written in the tropics and is voluminous, but much less is known of its vagaries in the northern part of its range, such as in the Southern United States. Although the present program of the U.S. Public Health Service has been designed for emergency purposes, nevertheless a variety of experience is being obtained, and it is hoped that from the data secured it will be possible eventually not only to formulate recommendations for similar wartime operations, but also to develop a rational plan for the permanent control of dengue in the South, to be executed by local health departments operating with limited funds.

Texas Highway Bridge of Concrete Arches Designed to Resist Flood Flows

By COLEMAN H. COOK

CHIEF DESIGNING ENGINEER, BRIDGE DIVISION, TEXAS HIGHWAY DEPARTMENT, AUSTIN, TEX.*

COMPLETION of the U.S. 81 bypass through Austin, Tex., required a crossing over the Colorado River. An examination of nearby bridges indiated that the deck elevation required would call for xtensive approach work. However, since construction f the most recent of these bridges, three flood-control ams had been built upstream. Assuming that the dams ould lower the flood peaks, it was deemed possible to rop the grade of the new bridge below the previous highater elevation.

The control structures are located at distances of four, wenty, and sixty miles upstream from the bridge site. ccording to information available, the dams would be perated primarily for flood control—the purpose of heir construction. When they are so operated, it was stimated that the flow of the river at the bridge site ould reach a maximum of 125,000 cu ft per sec. The ridge openings were designed to accommodate this flow.

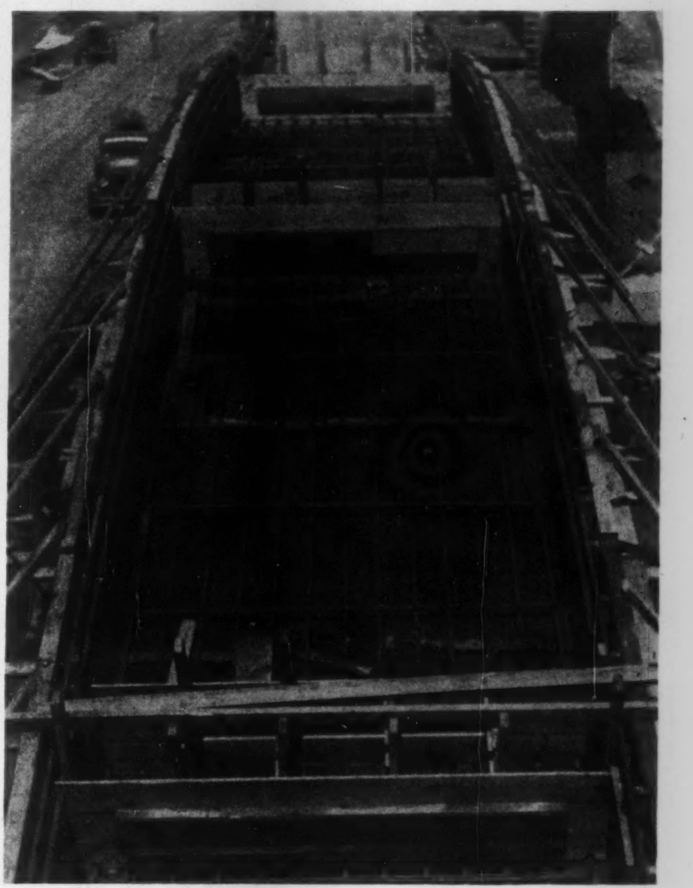
TABLE I. ORDER OF CONCRETE PLACEMENT

. Crown section Span 1
. Crown section Span 1
. Crown section Span 3
. Two haunch sections simultaneously, Span 1
. Crown section, Span 4
. Two haunch sections simultaneously, Span 2
. Crown section, Span 5
8. Two haunch sections simultaneously, Span 3
9. Crown section, Span 6
10. Two haunch sections simultaneously, Span 4
11. Two haunch sections simultaneously, Span 5
12. Two haunch sections simultaneously, Span 6

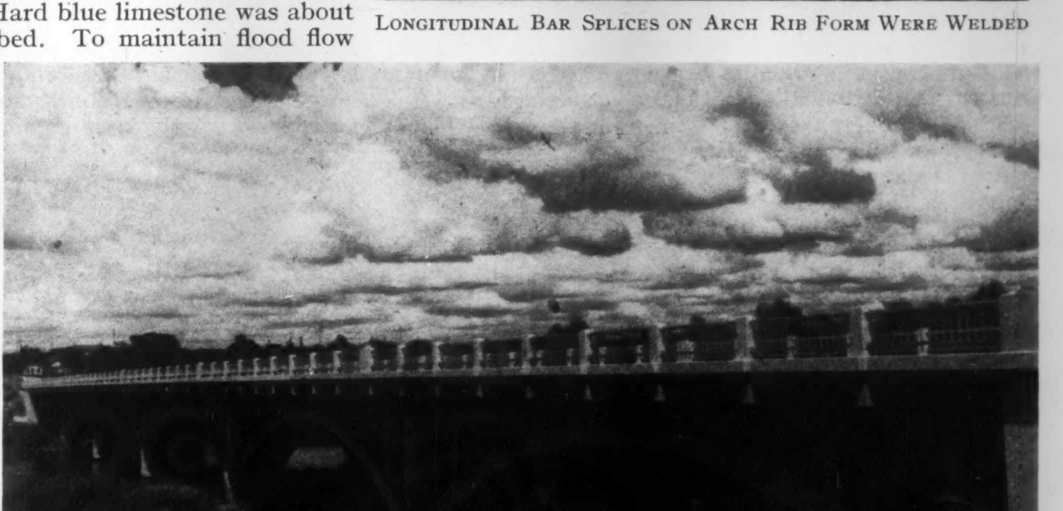
Despite assurances that the dams would control flood flow, it was deemed wise to erect a structure which could resist submergence. Therefore a concrete arch design was selected even though the distance to rock was somewhat too great for economy. Hard blue limestone was about 27 ft below the stream bed. To maintain flood flow capacity and still hold the grade line low, an arch of low rise was chosen. The rise of the arch rings is 19 ft $1^9/_{16}$ in. to a span of 105 ft. There are six such spans carrying a 42-ft roadway and two 3-ft 6-in. walks.

This structure has an overall length of 659 ft and contains nearly 13,000 cu yd of concrete. Other principal quantities were 816,037 lb of reinforcement and 11,300 cu yd of excavation for footings and approaches.

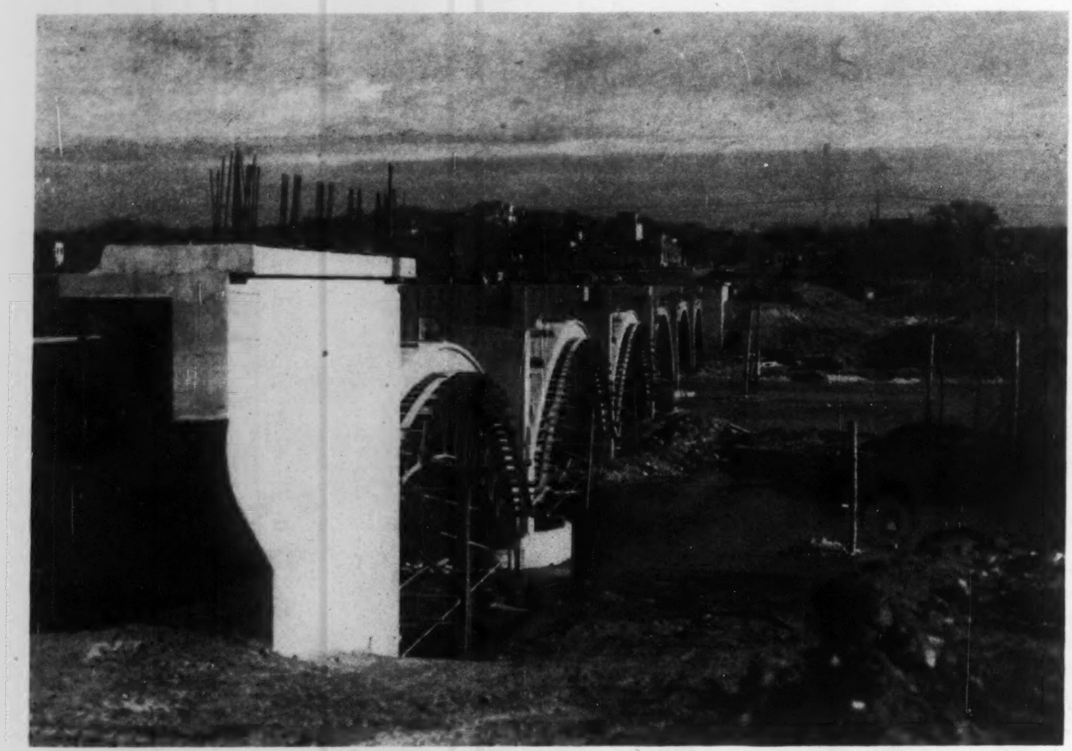
The arch rings were placed in voussoir sections with small spaces between, which were filled in after the main sections had set. This was done to minimize the effect



LONGITUDINAL BAR SPLICES ON ARCH RIB FORM WERE WELDED



LAMAR BOULEVARD BRIDGE IN AUSTIN, TEX.



CONSTRUCTION VIEW SHOWING CENTERING FOR THREE ARCHES IN PLACE SIMULTANEOUSLY

of rib shortening stresses set up in the rings due to shrinkage. The rings were placed in such sequence that no pier except Pier 3, the center one, would be subject to an unbalanced ring load. At this pier the south portion of the footing was extended to safely take the thrusts from one ring with no opposing ring thrust, or from two rings with but one opposing ring thrust.

In order to bend the thrust line downward and avoid the necessity of making the abutment footing excessively wide, a vertical open-end cell wall was constructed on each footing and filled with earth. With the earth directly above the abutments encased in a concrete wall on all sides, it was safe to assume that this earth would remain in place, even though an unforeseen flood did wash out the embankment adjacent to the abutments. Thus the stability of the abutments was assured.

The deck concrete was also set up for sequence placement in order to keep the stresses balanced and at a minimum. The deck for each span was divided into three separate units, the crown section and the two haunch sections. The order for placement was as given in Table I.

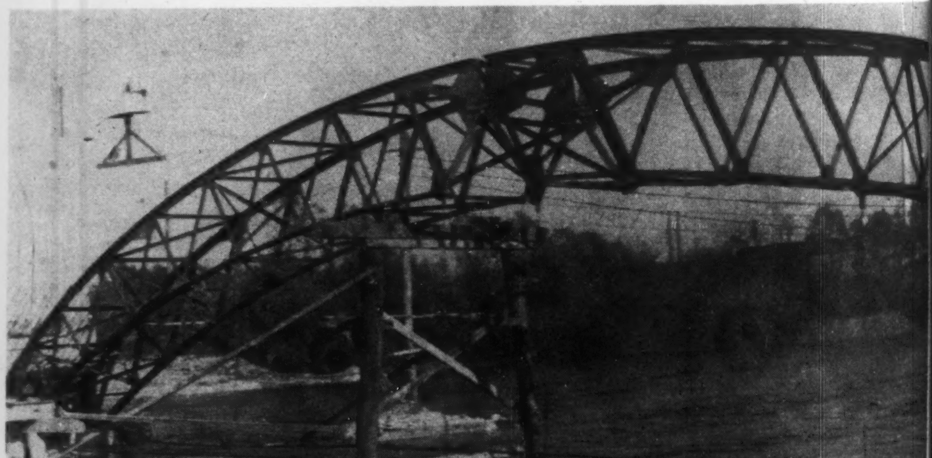
Trussed steel centering was used, to support the forms for casting the arch rings. Three sets of ring centering were used and worked out very satisfactorily. These steel arches were supported on the skewbacks. The shoes for the form arches at the skewbacks were tied together by a rod provided with a turnbuckle, and the crown of the form was then raised or lowered as needed by means of the turnbuckle adjustment. It wa found that by adjustin the form about $^1/_2$ i high the ring would b in proper position whe the full concrete rin load was in place.

The contracto elected to use open ste sheet cofferdam construction for the abutments and Pier 3. I all cases the cofferdam were unwatered successfully and the concret placed in the dry. Contrary to some theories the earth pressur varied from nothing a the top to a maximun at the bottom, as wa evidenced by the depth the strut plates were indented in the wales.

For Piers 1, 2, 4, an 5, the contractor use concrete caissons These were carried dow by open dredging and in all cases sealed of without much difficulty so that the concrete could be placed in the dry.

The contract, which was awarded to Cage Brother and L. A. Turner, January 24, 1941, specified 300 working days for completion of the work. In spite of the wa and the shortage of all classes of labor, the bridge wa finished in July 1942, within the allotted time.

The plans were prepared by, and the construction carried on under the supervision of, the Texas Highway Department, with D. C. Greer, M. Am. Soc. C.E., State Highway Engineer; G. G. Wickline, State Bridge Engineer; Coleman H. Cook, Chief Designing Engineer, i charge of design, assisted by E. B. Stokes, and R. S Guinn, M. Am. Soc. C.E., Designing Engineers; H. E M. Stevenson, Assoc. M. Am. Soc. C.E., Resident Engineer, under the supervision of E. H. Manigault, District Engineer. Hubert Holiday and R. W. Gooch were superintendents for the contractor.



STEEL ARCHES SUPPORTED ARCH RIB FORMS; CROWN ELEVATION ADJUSTED BY TURNBUCKLES

Pacific Coast Quay Founded on Deep Clay

Walls Supported on Sand Piles Jetted Into Place

By W. W. Moore, Assoc. M. Am. Soc. C.E.
Dames and Moore, Consultants, San Francisco, Calif.

The site chosen for erection of a quay for the U.S. Navy on the West Coast presented unusual foundation problems. The material was unstable and so deep that the use of piling was judged impracticable. The two solutions decided on have proved successful—first, displacement of the soft clay by rock fill, and second, and more unusual, the introduction of sand piles into holes jetted through the clay blanket. Settlement data are given by Mr. Moore as a supplement to the paper, which he presented at the Los Angeles Meeting of the Soil Mechanics and Foundations Division of the Society.

Rather unusual construction features were developed by engineers for quay walls at a U.S. Naval dry dock near San Francisco, Calif. Foundation soils were very soft clays in a blanket up to 60 ft thick, under about 40 ft of water at the outside of the quay walls. Faced with these difficult conditions, and also by limited time and restrictions on the use of critical materials, the designers made decisions which provide valuable lessons. The solutions have not been the product of any individual's efforts, but rather the result of discussions and cooperation between the various engineers concerned, the Naval officers in charge of the work, and the construction staff.

Two types of quay walls were constructed. In both design and construction they differ so much that separate descriptions are necessary. Both are in active service and are to all appearances behaving satisfactorily.

TIMBER CRIB QUAY WALL

At one of the quay wall sites, the foundation consists of a 10-ft layer of sandy clay loam over a 25-ft layer of gray clay containing decomposed vegetation. Underlying this is a stable bed of disintegrating serpentine. The design required that a minimum depth of 40 ft at mean lower low water be maintained on the seaward side of the quay wall, and that the structure be designed to resist the forces of filling on the landward side. Soils immediately below the base of the quay wall are very soft clays which have been formed as recent bay deposits. At some places beneath the structure, considerable depths of firm older alluvial soils underlie the recent bay-deposited clays, and at other locations a rather shattered metamorphosed rock lies below the soft clay.

The physical characteristics, shearing strengths and angles of internal friction of the foundation soils were determined by a series of tests made on undisturbed core samples $2^1/_2$ in. in diameter. The method of sampling and testing was described in an article entitled "Practical Shear Tests for Foundation Design," by Trent R. Dames (Civil Engineering for December 1940).

A stability analysis was made to ascertain the order of magnitude of the forces that would have to be resisted by the quay wall structure. The first analysis used was a modification of the Swedish sliding circle. An attempt was made to select arbitrarily the segment of the quay wall and foundation that would give a low factor of safety. The foundation soils were found to be entirely inadequate in strength to prevent failure of the structure.

A second approach to the analysis of the behavior of the foundation soils was made by plotting stress contours showing the intensity of the shearing stress at various points below the structure. The intensity of these stresses was compared with the shearing strength of the foundation soils at various depths. Again it was found that the stresses imposed by the structure would greatly exceed the strength of the foundation soils, and that a serious failure was to be expected. A third type of analysis, by analogy with a squeeze test for determining the shearing strength of the soft clay, was also made, and led to similar conclusions.

From the results of these analyses, it seemed evident that some means must be found to support the quay wall structure on the firmer soils, or rock, which were at some

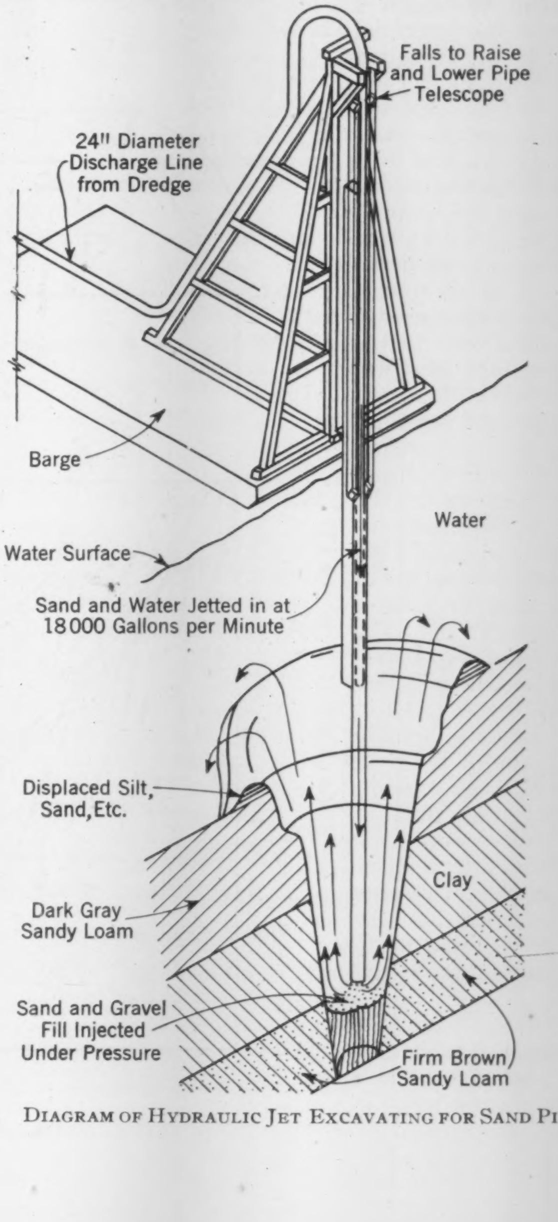


Fig. 1. Diagram of Hydraulic Jet Excavating for Sand Piles

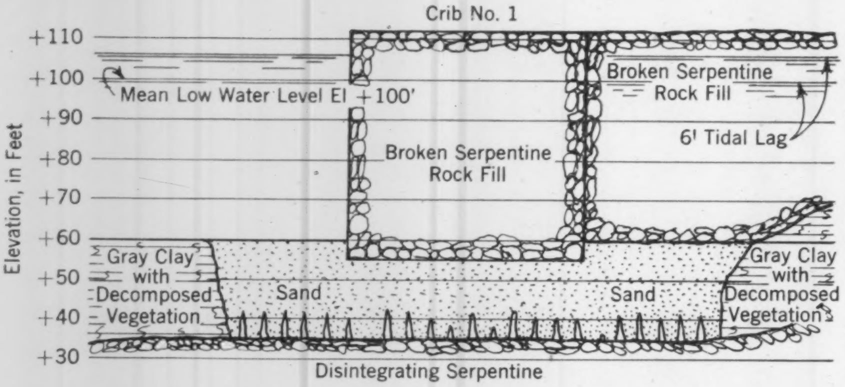

Crib No. 1
+110
+100
+90
+80
+70
+60
+50
+40
+30
Elevation, in Feet
Mean Low Water Level El +100'
Broken Serpentine Rock Fill
Broken Serpentine Rock Fill
6' Tidal Lag
Gray Clay with Decomposed Vegetation
Sand
Sand
Gray Clay with Decomposed Vegetation
Disintegrating Serpentine

FIG. 2. SECTION THROUGH WALL ON SAND PILES

depths below the base of the wall itself. Loads, both vertical and lateral imposed on the quay wall structure, could be transferred to the underlying soils by means of driven or drilled piles, or by an excavation filled with stable material, such as sand or rock. At some locations the distance between the bottom of the proposed walls and the surface of the firm materials is as much as 60 ft. Aside from the fact that a tremendously large number of piles would be required to resist the forces, it would be difficult to design a system of vertical and batter piling which would be feasible for field construction where the piles must be driven to a cutoff level some 40 ft below low water.

Excavation of the entire area below the quay wall, so that it might subsequently be filled with stable material, also involved difficulties. In the first place no hydraulic dredging equipment capable of excavating to the depth required was available, and excavation by means of clamshell or bucket dredging would be slow and expensive. The soft clay which would be exposed in the banks of such a cut would tend to slough or creep slowly, so that it probably would be necessary to remove a much larger volume of material than the space required for a fill to support the structure.

Aside from the danger of caving of the soft clay, in this case consideration had to be given to the presence of a recently filled bank which was supporting nearby buildings. It was feared that excavations carried to any great depth near the shore line might disturb the stability of these existing structures, which were in operation as facilities of the Navy Yard. If steel sheet-piling had been available it would have been possible to drive a cellular cofferdam which could have been excavated and then filled with stable material.

A scheme is shown in Fig. 1 which was suggested by H. D. Gridley of the Navy Public Works Office to enable the placing of a stable fill between the bottom of the quay wall structure and the surface of the firmer deposits without making an open excavation. The scheme uses a jet driven by a hydraulic dredge. The jet pipe is lowered into the soft clay while the hydraulic dredge is pumping water, which cuts the clay from beneath the pipe. In this fashion a hole is washed out vertically down to the surface of the hard material.

Then the dredge cutter is lowered into a bank of sand so that sand is delivered through the jet pipe, which can then be withdrawn upward, while the hole which was previously cut is being filled with the sand. This

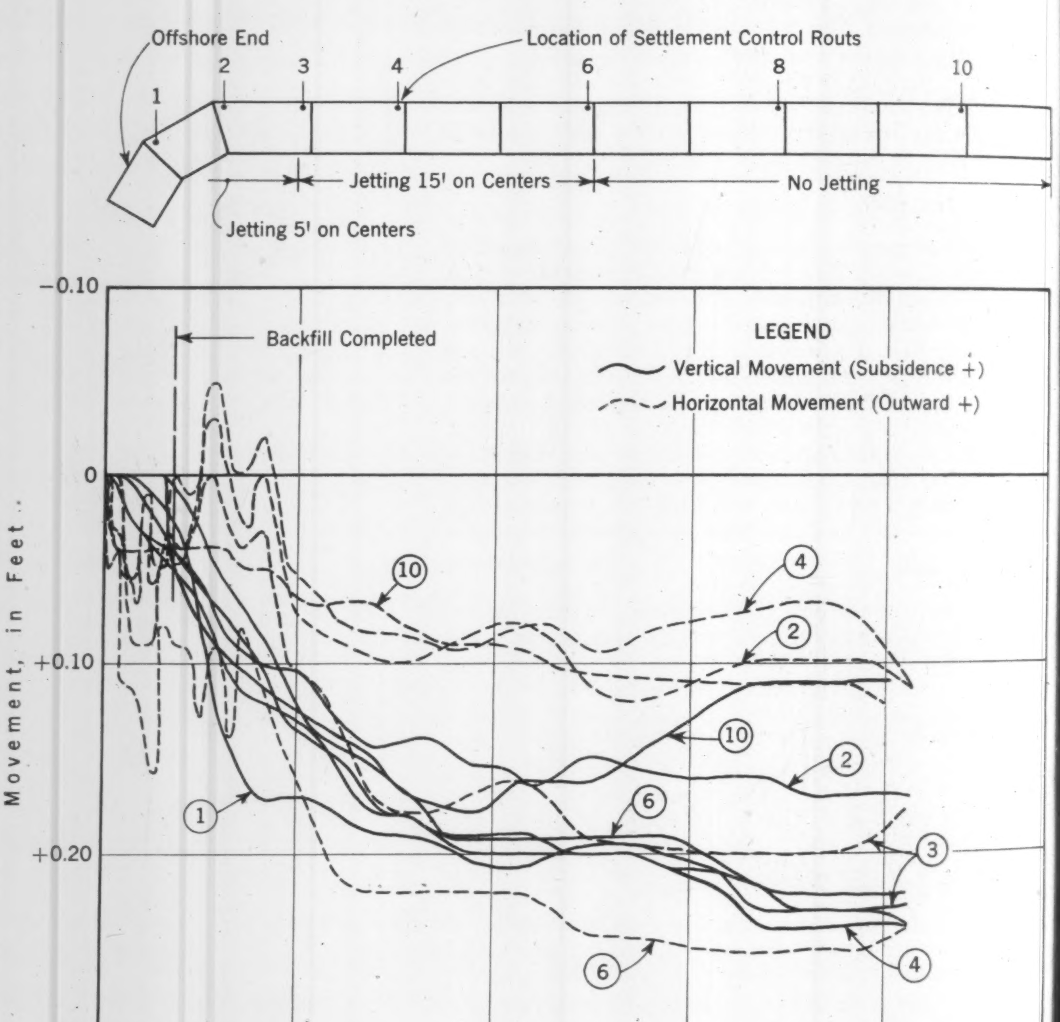


FIG. 3. SETTLEMENT RECORD OF POINTS ALONG QUAY WALL ON SAND PILES

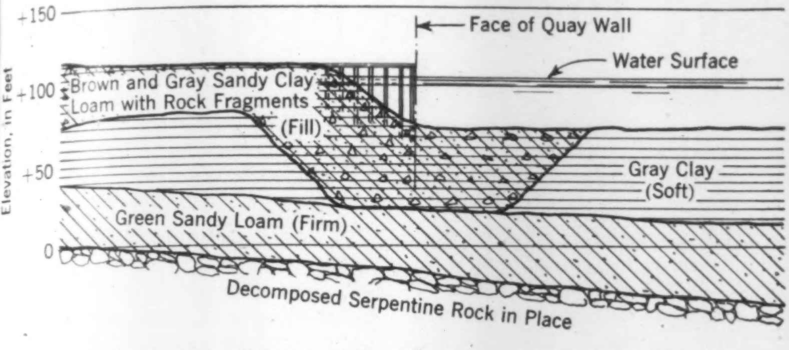


Fig. 4. Section Through Wall Constructed on Rock Fill

operation was repeated at 5-ft intervals, so that the sand-filled holes comprised about one-third of the total area of the foundation. Some analyses were made which indicated that it would not be necessary to remove all the clay, and the small islands, or pinnacles, of clay which remained between the sand-filled holes were not believed to be detrimental to the foundation support.

After the soft clay foundation soil had been largely replaced by the more stable sandy fill, the slip circle analysis was repeated. This led to the conclusion that a factor of safety of approximately $1^{1}/_{3}$ had been created.

After the foundation fill was placed by the jetting method, the timber crib structure was erected on it. Next the cribs were filled, the concrete face wall poured, and the structure backfilled (Fig. 2). Surface paving and utilities were then placed. Records of subsidence and lateral movements of the structure at several points along its length are shown in Fig. 3. The record of settlement and deflection begins at the time the timber crib structure was placed on its foundation, and a considerable proportion of the movements shown occurred during the filling of the cribs and backfilling behind the quay wall. The date of completion of the filling is noted, so that the amount of movement since all the loads were applied to the structure can be seen.

Jet Pipe was Lowered Into Soft Clay, Removing the Clay and Depositing Sand

At the site of the second quay wall, nearly 100 ft of soft gray clay and green sandy loam covered the decomposed serpentine rock. Water at this site was quite shallow. Conditions were not complicated by the presence of existing structures near the shore line; otherwise the soil conditions were not greatly different from those existing at the site of the first quay wall just described. At this second site, some consideration was given to the construction of an extension for the hydraulic dredge to permit removal of all the soft clay and placing of a stable rocky fill. This scheme was abandoned because the fill which existed along the shore line contained a considerable quantity of large rock fragments. It was feared that these rocky materials would fall into the cut and interfere with the operation of the dredge. It was therefore decided to make the cut with a clamshell dredge.

General features of the quay wall are illustrated in Fig. 4, which shows a cross section of the proposed rock-fill quay wall.

The plan was to excavate a trench to remove the soft gray clay and expose the surface of the firmer alluvial soils which underlie the site. The trench was then to be filled with rocky material which would have a high angle of internal friction and have sufficient resistance to prevent lateral displacement of the fill towards the bay.

It was also planned to construct a marginal dock for access to shipping adjacent to the shore line. Analyses of the stability of the structure were made by taking several trial slip circles passing through the fill itself, through the soft clay on each side of the fill, and through the firmer alluvial soils below the rocky fill. The lowest factor of safety was found by assuming a surface of rupture through the soft gray clay on both sides of the rock-fill quay wall, and beneath the rock fill itself through the surface of the older alluvial soils. This slip circle showed a factor of safety of about $1^{1}/_{3}$.

The plan of construction of the quay wall is shown in Fig. 5, which is a longitudinal section through the quay wall while it was under construction. The area of the quay wall was first dredged hydraulically to provide a depth of approximately 25 or 30 ft of water. The clamshell dredge was brought in and an excavation was made near the end of the quay wall, where the firm soils were close to the ground surface. Heavy, rocky fill was then placed by end-dumping from trucks so that the fill was deposited in the hole excavated by the clamshell dredge. The dredge was then moved along the line of the quay wall so that it removed all the bay mud, exposing the surface of the firm older alluvial deposits in an area immediately ahead of the rock fill.

Rocky fill was carried along progressively, following the clamshell dredge. In this fashion it was not necessary to excavate a long trench and keep it open while the filling was carried on. Such sloughing or creeping of the banks of the hole in the soft clay as occurred was not serious. Most of the soft soil was removed by the clamshell, and practically all the remainder was displaced toward the clamshell by the weight of the fill as it was worked into the dredge cut. In essence, the structure is nothing more or less than a gravity rock-fill dam. In the particular site where it is constructed, fill material was available close by, and this method has proved to be reasonable in cost and probably will be more permanent than many other types of structures.

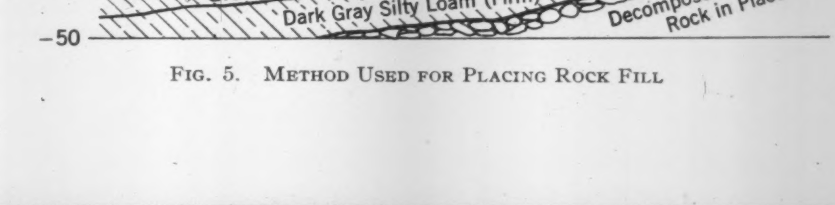


Fig. 5. Method Used for Placing Rock Fill

The Great Floods of 1943 and 1944 on the Middle Mississippi River

By LAWRENCE B. FEAGIN, M. AM. SOC. C.E.

COLONEL, CORPS OF ENGINEERS; DISTRICT ENGINEER, ST. LOUIS ENGINEER DISTRICT, ST. LOUIS, MO.

WITHIN the brief span of a year, two floods have swept down the Mississippi River, reaching stages at St. Louis greater than any others during the past century, since the great flood of 1844. Both these floods resulted in widespread damages not only to vast fertile agricultural areas, but to railroads, highways, and other property as well. Intensive protection work during the year by the Corps of Engineers lessened the damage done by the second flood despite its higher crest. As related by Colonel Feagin, additional loss was saved by well-organized flood fighting.

PRIOR to the floods of 1943 and 1944, a rather comprehensive plan for fighting floods had been developed by the St. Louis Engineer District, by which the District was divided into areas, which in turn were subdivided into sectors. The extent of the St. Louis Engineer District will be noted from Fig. 1. Qualified officers and civilians were assigned to these areas and sectors well in advance, and reassigned to meet changing conditions as the floods developed. Two general divisions of responsibility were made, first, for rescue operations, and second, for flood protection operations. Rescue operations involved the removal by water of isolated local residents, livestock, and certain classes of farm machinery and other property. The floating-plant operations of the Engineer Department were closely coordinated with the rescue operations of the Coast Guard.

POPULATION AND LIVESTOCK EFFICIENTLY EVACUATED

During the 1943 flood, when a crest of 38.94 ft was reached on May 24, nearly 10,000 persons were evacuated, as well as nearly 40,000 head of livestock—hogs, horses, mules, cattle, goats, and sheep—and innumerable poultry. Approximately 175 amphibian jeeps supplied by the St. Louis Ordnance Depot operated most effectively in backwater areas and in flooded levee districts for the removal of families. Many of these were driven by plucky civilian chauffeurettes. In the 1944 flood, as a result of timely radio warnings, the rescue operations required were greatly reduced. The crest at St. Louis reached 39.14 ft on April 30. Throughout both floods, there were no known instances of loss of life by drowning due to lack of rescue facilities. Furthermore, the loss of livestock was very small.

In the flood fight to save levees, large numbers of troops were made available by the Sixth and Seventh Service Commands. In the 1943 flood, a total of over 8,000 federal troops was assigned to the flood fight in the St. Louis District alone, and in the 1944 flood about 10,600 federal and state troops were assigned, as well as 830 Italian prisoners of war. In addition, numbers of local residents gave effective assistance. Long hours, often under most trying conditions, were required of the flood fighters. The manner in which the troops, mostly from distant places, fought these two great floods could not have been more exemplary if they had been working to protect their own homes.

Typical of their unstinted efforts was the successful defense of a levee protecting some 4,000 acres, which was threatened with failure when water started pouring through a hole roughly equivalent in size to an 8-in. pipe. At this point a ring levee was quickly built on the back side, using approximately 20,000 sandbags. At one time when failure seemed most imminent and small fish were coming through the hole, 60 enlisted men placed 2,000 sandbags in 20 minutes.

Another example of energetic defense occurred in 1944 when the McGee Creek levee on the Illinois River was saved from being breached by extensive sandbag operations. At this point a U-shaped temporary levee had been built around a low point left for a drainage structure. When the sustained stage thoroughly saturated this critical section, a dredge was brought in and the U-shaped area pumped full of sand, thus providing necessary stability. A section of the flood wall at Claryville, Mo., was built up largely by Italian prisoners of war. This 23,000-acre area, known as the Perry County Levee District, was flooded in 1943, but was successfully defended in 1944.

In the 1943 flood, nearly 4,000,000 sandbags, supplied by the Granite City Engineer Depot, were filled and placed on levees, and about 3,000,000 in the 1944 flood. Some 400,000 fbm of lumber and about 80,000 lin ft of snow fence, as well as several barges of stone, were used to protect critical areas against wave wash and scour during the 1943 flood. Again in 1944 large quantities of these materials were used. As a result, the 1943 flood fight saved from overflow approximately 235,000 acres protected by levees, and the 1944 flood fight saved about 310,000 similar acres. It is apparent, therefore, that both flood fights were fully justified.

In all these operations a most gratifying spirit of cooperation prevailed among the Army Engineers, the Coast Guard, the Sixth and Seventh Service Commands,

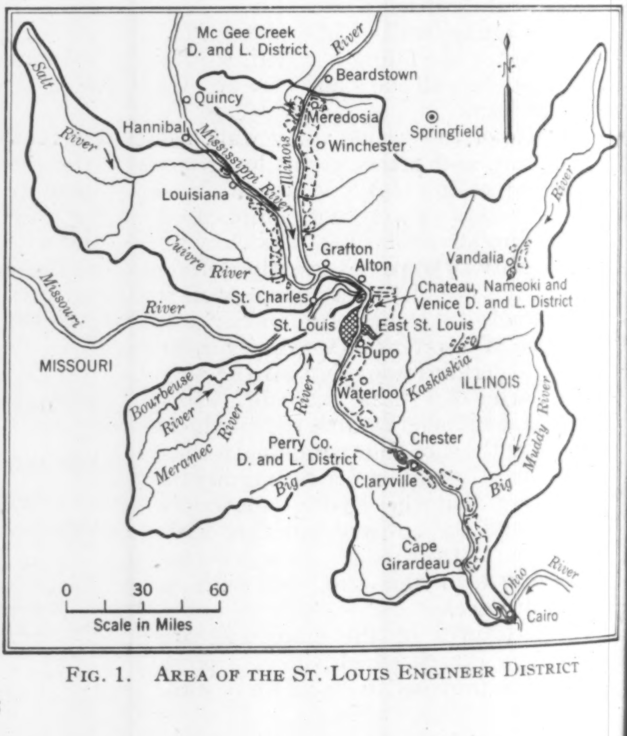


FIG. 1. AREA OF THE ST. LOUIS ENGINEER DISTRICT

Ring Levee Around Sand Boil in Chouteau-Nameoki-Venice Levee Required 20,000 Sandbags

the Army Air Forces, the Medical Units of the Army, the Ordnance Department, the Field and Coast Artillery, the Military Police, the Weather Bureau, the American Red Cross, and state, county, and local officials and citizens.

EXTENT OF AREAS INUNDATED AND FLOOD COSTS

Notwithstanding these extensive operations, however, it was impossible to prevent the crevassing or overtopping of numerous substandard levees—levees not built to sufficient grade and section to withstand floods of such magnitude. In no case were levees which had been built to present authorized grade and section breached or overtopped by either of these floods. Of approximately 438,000 acres in 49 organized levee districts within the St. Louis Engineer District along the Mississippi River (the 300-mile section extending from Cairo, Ill., to a point 9 miles below Hannibal, Mo.), along the Kaskaskia River, and on the lower 80 miles of the Illinois River, and in addition about 40,000 acres in privately owned districts, a total of about 243,000 acres was inundated by the 1943 flood. The 1944 flood inundated about 168,000 acres of these levee districts. The total area inundated within the St. Louis District, including both protected and unprotected areas, was about 550,000 acres in the 1943 flood, and about 475,000 acres in the 1944 flood. The total cost, including flood fighting and damages, of the 1943 flood within the St. Louis District alone approximated $32,000,000, and that for the 1944 flood approximated $25,000,000.

CONGRESS MAKES APPROPRIATIONS

Congress, recognizing the importance of these rich bottom lands to the war effort, appropriated in July 1943 the sum of $10,000,000 for the purpose of restoring the protection previously enjoyed by these broad fertile areas as well as that enjoyed by flood-ravaged areas along the Missouri, the Arkansas, and other streams. An appropriation of $12,000,000 for similar purposes was authorized by Congress on May 29, 1944, of which about $4,600,000 has been allotted to the St. Louis District.

Field surveys and the preparation of plans and specifications for repairs were expedited. In some instances it was found that blue holes had been formed near enough to the river to permit filling by hydraulic dredges. In some cases these holes were deep enough to cover a 5-story building. The repairs to levees made necessary by the 1943 flood involved over 5½ million cu yd of earthwork. An intensive safety program made possible the accomplishment of this work without a single lost-time accident to any contractor's employee. The program of repairing levees damaged by the 1944 flood is now being vigorously prosecuted. Both these authorizations provided only for restoring the protection existing at the time of the floods, including strengthening of threatened sections, minor setbacks, and the raising of short, low sections.

The occurrence of two such floods in close succession makes timely a discussion of their characteristics in comparison with those of previous floods. The rains which caused the 1943 flood fell within a radius of about 300 miles to the west, north, and northeast of St. Louis, on an already saturated watershed. Isohyetal lines indicate that between May 6 and 20 precipitation ranged from 4 in. to a maximum of about 19 in. in this area. The weighted average over about 100,000 sq miles was about 7.9 in. Thus, the water which fell on this area totaled approximately 42,240,000 acre-ft.

CHARACTERISTICS OF THE RECENT FLOODS

The total runoff from this storm is difficult to determine in view of the fact that additional rains occurred prior to completion of the runoff of the May storm, causing a further smaller flood in June. Stream-flow measurements, however, indicate that during the period between May 18 and 31, during which the river exceeded the flood stage of 30 ft on the St. Louis gage, a total of about 18,162,000 acre-ft rolled past St. Louis. Thus, the runoff for this selected period was the equivalent of an average of about 3½ in. over the 100,000 sq miles of watershed producing the flood.

Very nearly half this volume came from the Missouri River watershed, and the remainder from the upper Mississippi and the Illinois. In 1943, at Meredosia, Ill., the Illinois River rose to a height exceeding all other stages of record by 4.8 ft. The 1944 flood at this location, however, was some 3.4 ft lower, although more than a foot above the highest stage of record prior to 1943.

The rains which caused the 1944 flood fell generally throughout the Missouri and Mississippi River basins and generally were more distant from St. Louis than those of 1943. Both these floods were of such magnitude on the lower Missouri that water flowed from that river across the narrow neck of land below St. Charles into the Mississippi. Some erosion was caused in this area, although it was not sufficiently extensive to threaten, for the present, the creation of a cutoff.

Table I. Comparison of Floods on the Middle Mississippi

Stages in Feet, Discharges in Cubic Feet per Second

	St. Louis, Mo.		Chester, Ill.		Cape Girardeau, Mo.		Cairo, Ill.
Flood	Max. Stage	Max. Discharge	Max. Stage	Max. Discharge	Max. Stage	Max. Discharge	Max. Stage
1844	41.32	1,300,000	39.83	1,340,000	42.53	1,350,000	46.8
1858	37.21	1,025,000	35.7	1,070,000	37.7	1,090,000*	49.53
1892	36.0	902,000	31.2	940,000	.... †	960,000*	48.29
1903	38.0	1,020,000	33.4	1,062,000	36.53	1,082,000*	50.57
1927	36.1	890,000	34.41	1,060,000	40.04	1,080,000*	56.4
1943	38.94	840,000	38.08	873,000‡	42.37	893,000§	53.0
1944	39.14	844,000	37.3	842,000	40.70	812,000§	51.2

---

* Estimated—discharge at Chester plus 20,000 cu ft per sec from Big Muddy.

† No stage available.

‡ Main channel only, diversion through levee break not measured.

§ Levee at Gale, Ill., Mile 46.0, dynamited to release impounded water; discharge at Thebes, Ill., Mile 43.7, U.S.G.S.

While both these floods reached stages at St. Louis exceeding all other stages during the 100-year period since the great flood of 1844, the maximum flow as determined by the U.S. Geological Survey was substantially less than the flow of several other floods occurring during that time. A comparison of some of the great floods of record is given in Table I. It will be noted that the maximum discharge at St. Louis in the 1943 flood was about 840,000 cu ft per sec with a gage reading of 38.94, as compared with a maximum discharge of about 1,020,000 cu ft per sec for the 1903 flood with a maximum stage of 38 ft, which was very nearly 1 ft lower. While this would appear to be evidence of an increase in flood heights under modern conditions as compared with gage heights for earlier floods of equal discharge, no definite conclusions can be drawn in this connection because of the uncertainty of the earlier methods of stream gaging.

The total volumes during the periods in which the river exceeded the 30-ft flood stage at St. Louis for four of these floods are compared in Table II. In Table III there are given, in acre-ft, the volumes of flow computed in 2-ft increments for those portions of the four flood hydrographs exceeding the flood stage of 30 ft on the St. Louis gage. For all these floods 30 ft is assumed to be bank-full stage.

TABLE II. VOLUMES, CREST DISCHARGES, AND STAGES OF FLOODS AT ST. LOUIS, MO.

During Periods When 30-Ft Flood Stage Was Exceeded

Year of Flood	Inclusive Dates	No. of Days	Total Volume, Acre-Ft	Max. Discharge, Cu Ft per Sec	Max. Stage, Ft
1844	14 Jun.–17 Jul.	34	64,636,000	1,300,000	41.32
1903	2–18 Jun.	17	26,350,000	1,020,000	38.0
1943	18–31 May	14	18,162,000	840,000	38.94
1944	23 Apr.–13 May	21	26,746,000	844,000	39.14

It will be noted that the volume of water flowing in that zone of high stages which produced the greatest damage was only a relatively small part of the total, and definitely within the realm of practical impoundment. For example, if 1,274,000 acre-ft had been held back from the flood crest of the 1943 flood, the stage at St. Louis would have been reduced nearly 3 ft, and if a total of about $5^1/_2$ million acre-ft had been stored during this critical period, the stage might have been reduced nearly 9 ft to the flood stage of 30 ft, eliminating nearly $20,000,000 worth of damages and preventing nearly 250,000 acres of land from being overflowed in the section between the mouths of the Missouri and Ohio rivers alone.

TABLE III. VOLUME OF FLOW IN 2-FT INCREMENTS FOR PORTION OF FLOOD EXCEEDING 30-FT FLOOD STAGE ON ST. LOUIS, MO., GAGE

Stage, Ft	Flood 1844, Acre-Ft	Flood 1903, Acre-Ft	Flood 1943, Acre-Ft	Flood 1944, Acre-Ft
30 to 32	6,085,000	2,773,000	1,466,000	2,244,000
32 to 34	5,440,000	2,365,000	1,272,000	2,844,000
34 to 36	4,132,000	1,712,000	1,217,000	1,483,000
36 to 38	3,127,000	1,230,000	1,164,000	1,388,000
38 to 40	2,232,000	......	......	......
38 to 39.14	......	......	......	294,000
38 to 38.94	......	......	110,000	......
40 to 41.3	814,000	......	......	......
0 to 30	42,806,000	18,270,000	12,933,000	18,493,000
0 to 41.3	64,636,000	......	......	......
0 to 39.14	......	......	......	26,746,000
0 to 38.94	......	......	18,162,000	......
0 to 38	......	26,350,000	......	......

OVER 250,000 SANDBAGS WERE USED FOR THIS RING LEVEE AT MCGEE CREEK, OPPOSITE MEREDOSIA, ILL.

Thus railroad service along the Mississippi vital to the war effort would not have been disrupted; highways throughout the flood plain would have remained in service; and the economic life of the valley would have remained undisturbed. It will be understood, of course, that substantially greater storage capacities in suitable locations would be required in actual practice to insure the holding back of flood waters during critical periods. Nevertheless, this is an indication of what might be accomplished by the use of flood control reservoirs.

In the Flood Control Acts of 1936 and 1938, the Congress included in its authorizations a number of levee projects for the middle Mississippi River between the mouths of the Missouri and the Ohio. These projects were authorized to be built at federal expense, local interests being required to furnish the necessary rights of way, to maintain the levees, and to hold the United States free of claims for damages. Under this authority the 15-mile levee protecting some 9,400 acres of extremely fertile land on Kaskaskia Island, Randolph County, Illinois, was completed. It is estimated that the damages prevented by this levee during the 1943 and 1944 floods alone exceeded its cost about twofold.

A number of other levee projects were well advanced when further construction was stopped because of the war. In establishing levee grades, full consideration is given to the increased flood heights which will inevitably result from confinement by levees. When resumption of such civil activities is authorized and funds are made available it is believed that the levee program authorized by Congress for the middle Mississippi may be completed within a period of from two to three years, and at a cost substantially less than the damages caused by the 1943 and 1944 floods.

COMPREHENSIVE CONTROL METHODS NEEDED

In summary, it is believed to be obvious that the magnitude of the flood problems is such that it is necessary to employ both reservoirs and levees under a broad unified plan to relieve the industries and fertile lands of the valley from the ever-recurring threat of floods. Such a plan has been prepared by the Corps of Engineers at the request of Congress. Much of it received congressional approval just prior to the war. The full accomplishment of the plan, therefore, only awaits approval of the remaining elements thereof, and provision of the necessary funds to permit vigorous prosecution following the end of the war.

Engineers' Notebook

Suggestions and Practical Data Useful in the Solution of a Variety of Engineering Problems

Engineer Corps Measures Progress by Types of Bridges Erected

By J. A. Hamilton

Lieutenant Colonel, Corps of Engineers; Engineering and Development Division, Office of Chief of Engineers, Washington, D.C.

On a recent tour of inspection of the extensive bridge-building work being carried out by American Army Engineers in northern France, I was struck by the apparent anomaly of "permanent" timber bridges replacing "temporary" steel ones. Certainly one paradox of the lightning drive of American armor across northern France has been the way American Engineers have measured bridge-building "progress."

Wherever and whenever they have been able to replace a World War II–type steel bridge with a plain World War I–type timber bridge, the Engineers have known that the Army was moving right along. This apparent progress "in reverse" is a clue to the indispensability of the two major steel bridge types—one British, one American—which have been the cutting edge in our thrust across the many streams of northern France. The British-designed Bailey Bridge and the American-designed Steel Treadway Bridge M-2 have been "standard" for emergency crossings of tanks and other heavy Army vehicles. Many of these emergency crossings have been completed under fire, with the Engineers often providing their own security defense against counter-attacks of enemy patrols.

As soon as the "far shore" has been cleared of enemy activity, however, succeeding echelons of Engineers construct homely but substantial timber trestle bridges near the same sites. These permanent timber bridges, requiring a day or two to complete, then take over the traffic load while the portable steel bridge moves forward again to a new crossing.

Portability and speed of construction are features of both the Bailey and the Steel Treadway bridges. This, plus their unusual versatility, makes the bridges "all things to all rivers" in fast moving military operations. The Bailey Bridge is an amazing Mechano set of interchangeable steel parts which can be fitted together by the simplest pins and bolts. Built on dry land, the Bailey Bridge is pushed out over the stream on rollers while it grows. It can be thrown across in a single clear span up to 240 ft, floated on pontons, or supported by intermediate trestles. The Bailey is strengthened for heavy loads by the addition of one or two trusses outside the initial single truss, or else by the addition of another or even two "tiers" above the initial truss. All these reinforcing members, like the original parts of the bridge, are locked together rigidly by the pin-and-bolt system.

The American Army's Corps of Engineers has procured large quantities of Bailey Bridge material in the United States, much of it from the Great Lakes area. The steel used is a special quality, high-tensile-strength alloy.

Training their own troops in the use of the Bailey, the Engineers have been giving in practice a pretty complete test of the Bailey's many capabilities. Masonry bridges destroyed by the retreating Germans have been patched together with Bailey sections into usable structures. One American Engineer unit even used French canal boats as giant pontons to support a Bailey Bridge they threw across one stream.

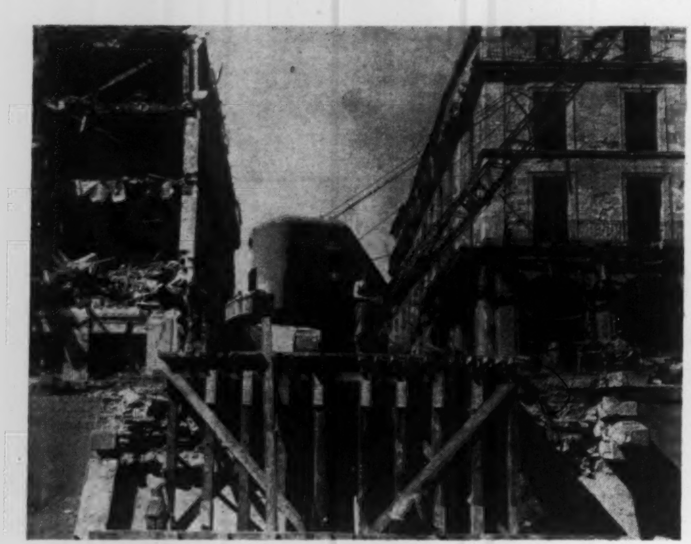
USES OF STEEL TREADWAY TYPE

The American Engineers' own bridge, the Steel Treadway M-2, has been classed as "restricted" information until very recently because of its great value in the armored break-through across France. Designed especially for carrying medium tanks, it is transported and erected by special Engineer Treadway Bridge Companies. Each of these companies carries enough trucks and equipage to construct 864 ft of bridge.

Although the steel treadways may be used on fixed trestles, they are ordinarily supported by pneumatic floats made of rubberized canvas tubes, 33 in. in diameter and formed into rings 33 ft long and 8 ft wide. When deflated, each of these floats can be packed into a carrying case 4 ft by 4 ft. Inflated by the Engineer mobile air compressors, each float has a maximum displacement of more than 35,000 lb. Saddles made up of steel beams

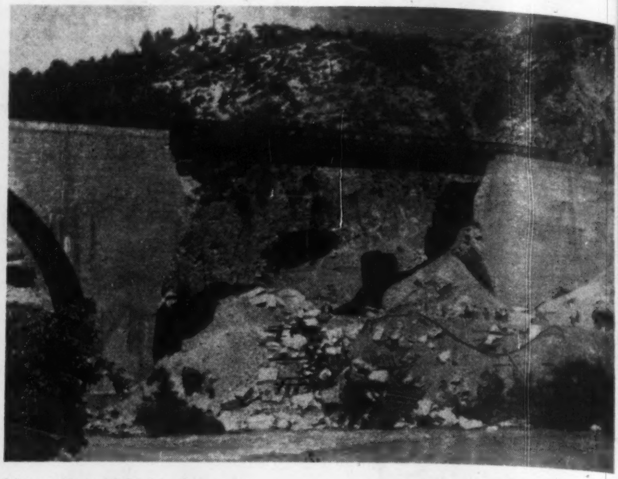
Signal Corps Photo

Steel Treadways and Pontons Carry Tank Traffic Across the Meuse River in Belgium



Signal Corps Photo

TIMBER IS USED BY THE ENGINEERS FOR A "PERMANENT" SPAN IN REUNESS, FRANCE



Official Photo U.S. Air Forces

TRAFFIC WAS RESUMED ACROSS THIS ITALIAN BRIDGE AFTER A BAILEY BRIDGE SPANNED THE GAP

and plates transmit the weight of the steel treadways uniformly to the floats. The treadways themselves are carried on special Treadway Bridge trucks which have a power crane operated by the truck engine to handle the heavy treadways. One complete unit of the bridge requires 36 of these special 6-ton trucks.

Although taking a day or two to build instead of the four to five hours for the steel bridges, the old-fashioned timber trestle bridge has the advantage of being built from materials which can be made readily available at any site. Their standardized design is very similar to the military bridges built by Army Engineers over many of the same streams in World War I.

The constant "grasshopper" tactics of moving the Bailey and Steel Treadway bridges forward as the armies advance has made it possible for some Engineer companies to claim that parts of their bridges have put American tanks over more than a hundred French streams.

Simplifying Traffic-Lane Delineation

By OTTO K. JELINEK, M. AM. SOC. C.E.

PLANNING ENGINEER, CHICAGO, ILL., PARK DISTRICT

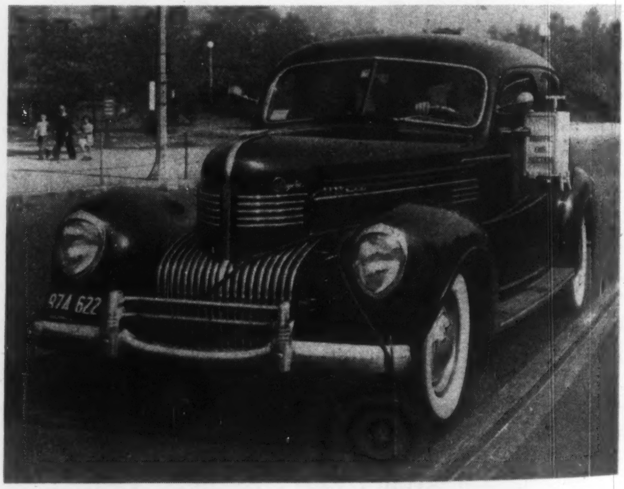
DURING the era of the surrey with the fringe on top, with its one or two-horsepower locomotion, delineation and marking of traffic lanes were unnecessary. This, of course, was because of the prevailing slow speeds and small volumes of traffic, coupled with the mode of living of the period.

With the advent of the automobile and its spectacular increase as a mode of transportation, many problems arose that required serious consideration by traffic engineers and other officials responsible for keeping the roadways safe and at their peak efficiency. Added to this increase of use, other factors, such as increased horsepower, increased speeds, and heavy volumes had to be contended with.

One method of providing adequate roadway capacity with safety was to lane-line roadways, especially at curves and wide, complicated intersections. In the past the Chicago Park District has experimented with such known methods as mathematical calculations, snow patterns, use of flour, use of sand, and other like materials to determine traffic patterns. While some of these methods had merit, it was found that considerable time was consumed in determining the proper alinement or channelization. In an effort to overcome limitations, a device was developed by V. G. Hofer, of our Traffic Section, that was found particularly useful in laying out channelization patterns and other complicated road-marking work, especially at curves.

The device consists of a 5-gal can with the necessary fittings, a master valve, 4 secondary valves, 4 rubber-hose run-offs, and side-mount brackets. One end of the run-off is connected to the secondary valve and the other end is fastened to the extremities of the bumper guard by means of a clamp.

The clamp is made from a $^1/_4$-in.-diameter rod, 24 in. long, shaped into a "U." The clamp is then placed over the bumper guard, with the hose run-off held to the clamp by means of two clips. Water is used as the marking liquid. The device is mounted on the door of a passenger car or light truck by means of a bolt that has a piece of



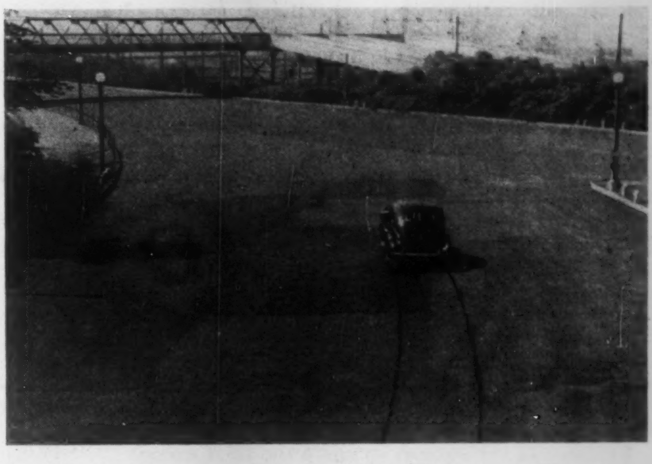
APPARATUS FOR MARKING TRAFFIC LANES ATTACHED TO A PASSENGER CAR

1½ by 3-in. flat rolled steel welded on the head of the bolt.

It is very simple to operate. The driver of the vehicle need only turn the master valve handle, which allows a small amount of water to flow to the secondary valves. These valves in turn are so regulated as to allow the water to drip onto the pavement, thus indicating a definite lane pattern. The road markers measure the lane widths from both sides or on either side of the drippings, depending on the physical road condition, then place marking points about 10 ft apart (parallel to the drippings), with marking keel, and follow up by stamping a smooth chalk line through the points, to serve as a guide line for the machine men.

The accompanying photographs illustrate the device and its use. Its advantages are as follows:

1. It defines lanes, no matter how complicated, according to the natural movements of drivers.
2. It saves considerable time in laying out work, particularly at curves.
3. It reduces traffic delays because of the time saved in laying out the markings.
4. It acts as a safety device in that smaller areas are closed to traffic, and further, that workers do not have to cross traffic as often as formerly to check measurements.
5. Its cost is negligible.



A Lane Marked by Simple Device Employing Water

A 5-gal can was used in the case illustrated, also an old hose from a traffic counter, although a gas hose would have served the purpose as well. The cost of the other fittings totaled $5.00. Those interested in building a similar device may obtain a copy of the working drawings by writing to Otto K. Jelinek, M. Am. Soc. C.E., Traffic Engineer, Chicago Park District, 425 East 14th Boulevard, Chicago 5, Ill.

Our Readers Say—

In Comment on Papers, Society Affairs, and Related Professional Interests

Many Central Americans Welcome Pan-American Highway

Dear Sir: Being a Costa Rican student of civil engineering, I have always read Civil Engineering with much interest, especially the articles concerning the engineering problems of Central America in general and of Costa Rica in particular. I was, therefore, especially interested in the article by Mr. Belyea, entitled "Commercial Use of Inter-American Highway," in the April issue, and the subsequent discussion.

I do not think that Mr. Belyea "ignores the fact that there is little or no commercial intercourse between the various countries of Latin-America" because he knows only too well that there must be some sort of inland communication among the Latin-American countries. Mr. Belyea knows that the small countries of Central America look for a brighter future which will bring not only commercial intercourse with their neighbors, but also a political and cultural exchange. He believes that it is by inland routes like the Pan-American Highway that the Americas may get to know each other and exchange ideas. Such a highway will make the people of this hemisphere abandon their egotistic and nationalistic ideas which tend to destroy Pan-Americanism.

The Pan-American Highway will be the first hole punched through the impenetrable walls of our frontiers guarded by our custom houses which, like iron doors, close the path to civilization. We, of Central America, want to have the system you so well maintain in the United States.

It is true, of course, that our most important routes should be constructed from the centers of the countries to the sea and vice versa, but I do not believe that this justifies the elimination of the Pan-American Highway. It is too expensive to run railroads in our small countries, which makes the tariffs high and justifies the construction of the highways parallel to the railroads. Of course, it must be kept in mind that there is no large and heavy transportation as in bigger countries. It is true that many people in Central America are not very happy about the actual results of the Pan-American Highway, because the building of it has created inflation and has taken away large numbers of people from the farms. However, it is only a temporary condition, and the Central American people are aware of this fact.

We, the people of Central America, do not want to know our neighbors by contacting them through monopolized means of transportation such as the sea and air routes. My friends in Salt Lake City want to make me a visit in Costa Rica, using their own means of transportation, which allows them the pleasure of stopping whenever they desire, to look at landscapes, to practice the language of the country they are crossing, and to know the country and its people. I do not believe that they would like to be guided by a tourist clerk from the port of entry to the hotel and from the hotel back to the port. Central America will be more democratic after the Pan-American Highway is built.

Luis Alberto Murillo
Senior Student of Civil Engineering,
University of Utah

Salt Lake City, Utah

Instrument for Measuring Stream Flow

To the Editor: In the November issue Messrs. Wilm and Storey have described a very ingenious and rugged instrument for the measurement of average velocity in a vertical section of flowing water. It has been the writer's privilege to use the rod and to note the ease and simplicity of its use.

In the article little attention is given to the method of computing the stream flow from the several measured velocities. In Table I of that article the total flow is obtained by multiplying the width of channel by the mean of the measured depths by the mean of the measured velocities. It is evident that the discharge varies with velocity and depth, which in general vary with the distance from the bank of a stream. An analysis indicates that the error introduced by the method used in Table I may be as high as 23%.

However, if readings of depth and velocity are averaged only if their range is small, say one-fourth the mean in each case, the correlation will be lower and the error much less. In this case the error due to averaging would be about 0.3%. The error will still be around 1% or less, if the range in depth and velocity is less than 0.4 of their mean.

The error thus introduced is due entirely to the method of computation used and is completely independent of the accuracy of the readings taken. It would be added to any error that is due to inaccurate or too few readings.

Since most of the readings in Table I are taken in a rectangular cross section, the variations in depth and velocity are so small that little error was introduced by averaging. In the one example where a non-rectangular cross section was used (a sand bar in a rectangular section), the error due to averaging was 1.3%, or half the reported deviation of 2.6%.

In Table II the authors compare the total energy $H + V^2/2g$, as measured by the piezometer and current meter several feet upstream of the weir, with $H + V^2/2g$ as measured by the rod on the crest of the weir. Using the crest of the weir as datum, the authors find deviations of approximately 1%. This may be somewhat misleading as a measure of the accuracy of the rod, since the total energy depends upon the level of the datum as well as the velocity. If the water level at piezometer is taken as datum, the deviations range from 20% to 200%. This suggests that the relative discrepancy in total energy is not too reliable an indicator of the accuracy of a single measuring device.

The authors use the term "hydraulic jump" to indicate the increase in water level when a stream meets an obstruction. It should not be confused with the "hydraulic jump" when the depth passes rapidly from below to above critical depth.

Two theoretical factors concerning the action of the rod may be of interest to some readers. It is well known that the mean velocity head in a vertical section is $\alpha V^2/2g$, where α is a constant always greater than one which depends upon the velocity distribution. Its value is probably between 1.1 and 1.2. Secondly, the rod does not depend upon a static column of water like a Pitot tube, but on a stream which continually flows up the rod. There must be some loss of head owing to friction and change of direction. It is interesting to note that these two factors produce results which tend to compensate for each other.

PAUL B. JOHNSON

Glendora, Calif.

Fundamentals of Flood Control

TO THE EDITOR: In his article in the September issue Colonel Elliott has given us a splendid presentation of the fundamentals of flood control. If the principles he has stated are kept in mind and followed, they will lead ultimately to that measurable control of floods we all look forward to. In connection with his subject, there are two things I should like to comment on. Both relate to natural valley storage and its place in the flood control picture.

First, I think it is of national importance that engineers, in justifying projects, use true measures of flood control capacity. The real contribution of a reservoir to flood control is only the storage it creates in excess of that already provided in the river in its natural state. It should be made clear that the effective flood control capacity of any reservoir is not the computed gross amount of new storage that is devoted to flood control but, instead of that, the gross storage minus the volume of storage that would be in the natural river at maximum flood. In main stem reservoirs, the net flood control capacity of a project may be only a fraction of the storage which is commonly labeled flood control capacity.

Second, I think it is important to realize the effect of losing natural valley storage, when, in the name of flood control, bottom lands are protected by levees. To the fellow downstream, this is flood control in reverse.

I have in mind in particular the effect of the proposed leveeing of both sides of the Missouri River from Sioux City to its mouth, a distance of 760 miles—the effect it will have on flood heights in the lower sections of the Missouri River and the Mississippi River at and below St. Louis. These levees would destroy some seven or eight million acre-feet of flood control storage that is just as effective for flood control as an equal amount of artificially created storage on the tributaries of the same section of the river. If not compensated for, this loss of storage would create a hazard of real magnitude to inhabitants downstream. People or the lower Mississippi may well be concerned about any further removal of natural valley storage by levees at upstream points. They also have reason to be concerned about the extent to which levee and drainage districts above them may already have increased flood heights.

Natural valley storage is as effective for flood control as the same capacity in artificial reservoirs. Loss of natural valley storage is just as effective in raising flood heights downstream as artificially created reservoir capacity is in lowering flood heights downstream. If we can compute how much artificial reservoirs will lower flood crests downstream, then we can, by the same methods, compute how much flood crests will be increased by loss of the valley storage behind levees.

In any appropriation of natural valley storage space by levees, the value of the protection to the local area should be compared with the loss to communities downstream. Leveeing of bottom lands will suffer in this comparison. One acre of bottom land, which during an extreme flood has, say, 5 ft of water over it for the duration of the flood, contributes 5 acre-ft of flood control capacity to people downstream. Flood control capacity artificially created by high dams may cost on the average about $10 per acre-ft. Thus the 5-acre-ft capacity on the one acre of ground in its natural state has a replacement value of $50 to people downstream, because when that 5 acre-ft of capacity is lost through leveeing, an equal amount of storage will have to be provided elsewhere before any net gain to flood control has been realized.

ALBION DAVIS, M. Am. Soc. C.E.
Chief Hydraulic Engineer, Union Electric Company of Missouri

St. Louis, Mo.

Public Works Projects Should Be Self-Liquidating

DEAR SIR: The article on existing and proposed control of the Missouri River by General Crawford, in the October issue, is very instructive. The magnitude of the work contemplated is quite impressive, even in this day of billion-dollar projects. After the astronomical sums of money that have been spent on various governmental works there is a tendency to think little of one more. However the total of $661,000,000, which this project is estimated to cost, is far from small change.

In any private work, money is not spent unless an analysis indicates that the probable returns from it will exceed expenditures. The same principle should govern public works as well. The mere fact that there is money available in the public treasury, and that certain local groups wish the improvement, does not necessarily justify it. Unless the work can be made either directly or indirectly self-liquidating, it should not be done.

In this case the records show twelve major destructive floods over a period of one hundred years. Three of these caused a total damage of $47,800,000. As these floods occurred in one season, it is probable that much of the damage was overlapping. In other words, had they occurred a year or two apart, each one might have caused nearly as much damage by itself. Only a careful study of the individual types of damage could accurately evaluate the probable corresponding damage of these floods under a different spacing.

However, there can be little question that one such flood alone would not cause more than $40,000,000 damage. Twelve such occurrences would amount to $480,000,000 over a period of one hundred years, leaving $181,000,000 to be paid off by such ephemeral benefits as navigation, irrigation, power, water supply, pollution abatement, wild life conservation, and recreation. As to navigation, the present transportation facilities are more than adequate in normal times. The amount of firm power that can be generated by a flood control system is not great in comparison to the amount of work involved. As to water supply, the present nearly unregulated flow seems to be adequate. The big farm problem seems to be that of profitably disposing of the present production, rather than developing new fields.

A great deal of sewage treatment could be accomplished for a very small fraction of the cost of this proposed work. As a duck hunter, I appreciate the fact that these reservoirs would be a factor in increasing the ducks. However there are also more effective means to be employed at much less cost. The item of recreation is somewhat of an intangible, though of course it has some value.

All things considered, this project would seem to be of rather questionable worth, well planned and designed as it undoubtedly is.

J. H. **Creed**, Assoc. M. Am. Soc. C.E.

Redwood City, Calif.

The Engineer in the Modern World

To the Editor: The subject of "labor relations" or "human relations" is of immeasurable importance, and as engineers we may aid considerably in the solution of the problem it implies, for human achievement must be conceived in the mind before it can become a reality and methods of coordination must especially be considered in anything involving a number of persons. The methods that have proved to be best suited to such undertakings are engineering methods. Every engineer must know the materials with which he has to work and the natural laws governing the materials, as discovered by observations and experiment and formulated by mathematics and mechanics. Otherwise, he cannot make the most profitable use of his resources.

Since the war began another factor has manifested itself and proved to be of the utmost importance—namely, the human factor. It has been found that maximum production may be obtained when, and only when, the production is carried on in conformity with certain psychological laws, determined by the analysis of human nature. Our globe is too small to support the population now upon it, unless that population be productive. Humanity must produce or perish! Production is essentially a task for engineers, since it depends upon the discovery and application of natural laws. It is, therefore, not a task for old-fashioned philosophical speculation or for barren metaphysical reasoning. It is a scientific task, involving the coordination and cooperation of all the sciences, and it is also an engineering task.

Engineering, rightly understood, is the coordinated sum total of human knowledge gathered through the ages, with mathematics as its chief instrument and guide. Human engineering will embody the theory and practice of all branches of engineering united by a common aim—the understanding and welfare of mankind. Mathematics is not a system of mere formulas and theorems; it is the science of exact and vigorous thinking.

Human engineering will throw a new light on many old conceptions, help to an understanding of matter, space, and time, and perhaps ultimately lead to an understanding of their absolute meanings. With engineering daily becoming more active and more far reaching, the old verbalistic philosophy and metaphysics have lost their reason to exist. The world of producers will welcome a philosophy of ordered thought and production.

We engineers must extend our sense of responsibility to all mankind instead of confining ourselves to a narrow specialization where we find pleasure. Our place and our duty are in the front line of struggling humanity, and not in the unperturbed ranks of those who keep themselves aloof from life. As engineers we know that wrong methods are alone responsible for disastrous results. The task of engineering is not only to know but to know how. If those who know why and how neglect to act, the world will continue to flounder. All people are interested in progress and in matters affecting the welfare of mankind. All these great matters are interdependent and interlocking. They must progress in balance. Civilization cannot be rebuilt when our knowledge of the sciences increases geometrically, while our knowledge of human nature increases only arithmetically.

What was the effect of the Newtonian law of gravitation? Stimulation. Inventions lead to new inventions, and each discovery to new discoveries. Science begets science—geometric progression.

But what of ethics and jurisprudence and economics and politics and government? For the answer we have only to behold the world. Engineers arise! Apply your precise, sharp, and complete definitions and your logic to the "social" sciences, and you will realize that the present methods of "labor" and "management" should be replaced by tolerance and coordination.

Charles F. **Parkinson**, M. Am. Soc. C.E.

Detroit, Mich.

Costs of Improving Navigation Questioned

Dear Sir: The very interesting article by Frederick B. Duis on "Navigation on the Ohio River," in the August issue, omits any mention of the economic value of this improvement on costs of transportation. Mr. Duis cites the fact that, by reason of these improvements, transportation via the Ohio River increased from 5 million tons in 1917 to $36^{1}/_{2}$ million tons in 1941, and that the length of haul has also materially increased.

He omits, however, any mention of the total cost of these improvements, either first cost, interest on this investment, or costs of maintenance.

Perhaps some of these costs should be charged to flood prevention or other necessary control of the regimen of the river, but the article conveys the impression that the improvements have all been for the benefit of navigation. If this is so or even very largely so, we should know whether the expenditures were justified by reduction of total costs of transportation.

Railways, whose rates are controlled by the government, have to pay wholly for their own account, costs of construction, costs of maintenance as well as actual costs of transportation. Trucks and automobiles on highways have to pay a tax, which covers some part of the cost of the highways they use. We as engineers should be interested to know how much of these costs of the waterways, and their maintenance, is borne by traffic which uses them, and how much is a free government gift, to which we as taxpayers have to contribute.

Fred **Lavis**, M. Am. Soc. C.E.
Consulting Engineer

New York, N.Y.

Forum on Professional Relations

Conducted Column of Hypothetical Questions with Answers by Dr. Mead

In the current issue Dr. Mead answers Question No. 27, which was announced in the October number of "Civil Engineering." The question states: "An engineering student who expected to graduate in June received in March an offer for a position from Company A. This he immediately accepted with the understanding that he was to begin work on July 1. In May, the student received from Company B an offer which he liked much better and which he thought offered a better chance for advancement. The student had signed no formal contract with Company A. What should he do?"

Dependability is one of the most necessary qualifications in any engineer. So if a young engineer has been offered a position and has accepted it, he should stand by his acceptance unless the prospective employer is willing to release him from his obligation after the situation has been explained to him.

Every man's word should be as good as his bond, and the fact that the student has not signed a formal contract is no excuse for not living up to his agreement.

Madison, Wis. Daniel W. **Mead**, Past-President
and Hon. M. Am. Soc. C.E.

Question No. 28, which was announced in the November issue, will be answered in the forthcoming, or January, issue. Next in the series the following question is announced. Replies may be received until January 5, with answers in the February issue.

Question No. 29: A member of a St. Louis (Mo.) consulting firm was recommended by friends to an out-of-the way municipality in lower Louisiana, to provide plans and specifications for, and superintend the construction of, a water works plant. The consulting engineer, learning that the officials and citizens of this municipality had no experience in employing consulting engineers, entered into an agreement to do the work for them without any stipulated price. Later, he sent them a bill for his services at a rate 50% higher than he would have asked for the same services in Illinois. What is the ethics in the case?

SOCIETY AFFAIRS

Official and Semi-Official

Annual Meeting Scheduled for January 17–19

New York City to Be Host to Ninety-Second Yearly Conference

EXPANSION of the activities of the Society and its Technical Divisions has made necessary additional space for the sessions of the Annual Meeting. When the Ninety-Second Annual Meeting is held in January 1945, all sessions will meet at the Hotel Commodore, on the corner of 42nd Street and Lexington Avenue, New York, N.Y. Technical meetings will begin on Wednesday, January 17, and continue through Friday, January 19.

Arrangements are in progress for several social events which will break into the practically continuous business and technical sessions. These are to occupy noon and evening hours. For a full program of the meeting see the January 1945 issue of CIVIL ENGINEERING.

The meeting will open with a general business session on Wednesday morning, at which reports will be presented on activities of the Society during 1944 and on other items of business. Society prizes will be awarded at this morning meeting and Honorary Memberships will be conferred. Prizes to be awarded include:

Norman Medal
J. James R. Croes Medal
Thomas Fitch Rowland Prize
James Laurie Prize
Collingwood Prize for Juniors
J. C. Stevens Award
Construction Engineering Prize
John Fritz Medal

Honorary Membership in the Society will be conferred upon Arthur James Dyer of Nashville, Tenn., long associated with the Nashville Bridge Company; Charles Philip Gross, Major General, U.S. Army, Chief of Transportation, Supply Division; Horace Williams King, Professor of Hydraulic Engineering at the University of Michigan before his retirement, and author of many books; Louis C. Sabin, Vice-President of the Lake Carriers' Association, with headquarters in Cleveland, Ohio; and Arthur Surveyer, consulting engineer of Montreal, Quebec, Canada.

Newly elected officers will be announced, a canvass of ballots will be reported, and new officers for 1945 will be inducted. At the close of this session, a general members' luncheon will be held in the hotel.

SCHEDULE OF DIVISION MEETINGS

Beginning Wednesday afternoon and running through Friday, a number of technical meetings will be held. It should be noted that these will also take place in the Commodore Hotel. A condensed schedule includes:

Wednesday afternoon, January 17

Construction, Sanitary Engineering, and Surveying and Mapping Divisions

Thursday morning, January 18

Sanitary Engineering, Structural, and Hydraulics–Waterways (Joint) Divisions

Thursday afternoon

Sanitary Engineering, Highway, and Hydraulics–Waterways Divisions

Friday morning, January 19

Soil Mechanics, Construction, Hydraulics–Waterways Divisions

Friday afternoon

Soil Mechanics and City Planning Divisions

Plans for these programs have been prepared under the guidance of Division committees or subcommittees, and all details will be printed in the program, to appear in the January issue.

ENTERTAINMENT AND SOCIAL EVENTS

In the Grand Ballroom of the Hotel Commodore on Wednesday night, January 17, the dinner and dance will be held, along with the reception for new officers and Honorary Members. Thursday evening the dinner-smoker will take place in the hotel beginning at 6:30. This will consist of a dinner followed by entertainment and opportunity for fellowship. At the hotel, arrangements can be made for small parties, such as alumni groups, during the dinner hour. Thus, reunions can be scheduled for Thursday evening if desired.

For the ladies who are attending the Annual Meeting, special entertainment is being arranged. A full announcement will appear in the meeting program.

HOTEL SITUATION ACUTE

Again it must be emphasized that the hotel situation in New York City is unbelievably congested. Reservations at any hotel must be made weeks in advance. Most hotels will not even consider accommodating as a guest anyone who does not have a confirmed reservation when he arrives at the hotel.

The Hotel Commodore has agreed to accept any members and their guests who are attending the Annual Meeting if they will so state when applications for reservations are sent in. Even then reservations should be made before December 15 if accommodation is to be assured. This hotel, which is to be the headquarters for the entire meeting, is directly connected to Grand Central Station.

For convenience, a list of a few of New York's hotels is printed below. These hotels have cooperated in furnishing rate schedules and are all located within a convenient distance from the meeting place in the Hotel Commodore. It is suggested that in writing for reservations the Society meeting be mentioned, and the preferred price of accommodations be stated.

Hotel Rates

HOTELS	LOCATION	SINGLE ROOM	DOUBLE ROOM
Commodore	Lexington Ave. & 42d St.	$3.50 up	$5.50 up
Astor	Broadway and 44th St.	3.00 up	5.00 up
Barclay	111 East 48th St.	6.00 up	8.00 up
Biltmore	Madison Ave. & 43d St.	5.50 up	9.00 up
Chatham	Vanderbilt Ave. & 48th St.	5.00 up	7.00 up
Claridge	Broadway & 44th St.	3.50 up	5.00 up
Edison	228 West 47th St.	3.00 up	5.00 up
Governor Clinton	Seventh Ave. & 31st St.	3.30 up	4.40 up
Lexington	Lexington Ave. & 48th St.	4.00 up	6.00 up
McAlpin	Broadway & 34th St.	3.30 up	4.95 up
Murray Hill	112 Park Ave.	4.00 up	5.00 up
New Yorker	Eighth Ave. & 34 th St.	3.85 up	5.50 up
Park Central	Seventh Ave. & 55th St.	5.00 up	7.00 up
Pennsylvania	Seventh Ave. & 33d St.	3.85 up	5.50 up
Pierre.	Fifth Ave. & 61st St.	7.00 up	9.00 up
Plaza	Fifth Ave. & 59th St.	6.00 up	8.00 up
Roosevelt	Madison Ave. & 45th St.	4.50 up	6.50 up
Savoy-Plaza	Fifth Ave. & 59th St.	6.00 up	8.00 up
Taft	Seventh Ave. & 50th St.	3.00 up	5.00 up
Vanderbilt	Park Ave. & 34th St.	3.00 up	6.00 up
Waldorf-Astoria . . .	Park Ave. & 50th St.	7.00 up	10.00 up
Woodward	Broadway & 55th St.	3.00 up	4.00 up

It does not seem necessary to mention the need to make arrangements for transportation in advance. Much publicity has been given to the impossibility of making train or air reservations on short notice. This is not in the least overdrawn—such reservations cannot be secured on short notice.

The meeting has been scheduled to begin in the middle of the week so as to best meet the convenience of members in travel and hotel accommodations. Thus the peak weekend burden on facilities can be sidestepped and visitors can enjoy the stimulation of the meeting to the maximum.

Professional Records of Nominees

Brief Biographical Sketches of Candidates for Society Offices

JOHN CYPRIAN STEVENS

JOHN CYPRIAN STEVENS was born in Moline, Kans., in 1876, and received his early schooling in Knoxville, Iowa. Enlisting in the 51st Iowa Volunteer Infantry in 1898, he saw service in the Philippine Islands in the Spanish-American War. Upon his return to the United States, he entered the University of Nebraska, graduating in 1905 with a B.S.C.E. degree. In 1928 he obtained the professional degree of C.E. from the same institution, and in 1938 the honorary degree of doctor of engineering from Oregon State College. During his junior year at college he was appointed assistant state engineer of Nebraska and six months later assistant engineer, U.S. Reclamation Service—he had taken the civil service examination in 1902—and was assigned to hydrographic work within the state.

JOHN CYPRIAN STEVENS
Nominee for President of the Society

He remained in government service until 1910, the last position being that of district engineer for the U.S. Geological Survey, in charge of work for the Water Resources Branch in the Pacific Northwest. In 1910 he opened an office for private practice in Portland, Ore., and in 1912 the Pearson Engineering Corporation, of New York, sent him to Barcelona, Spain, where for two and one-half years he made studies for a number of hydroelectric projects, and was project engineer during the construction of two of them—the Serós and Gerrí developments. Upon his return to this country, he was chief engineer in charge of the design and construction of the Oroville-Tonasket Irrigation Project in Washington.

In 1916 Mr. Stevens reestablished a consulting practice in Portland, Ore., which he still maintains—since 1920 in partnership with R. E. Koon, M. Am. Soc. C.E. The firm specializes in the design and construction of dams, water supply and irrigation projects, hydroelectric power plants, and sewage-disposal systems. And Mr. Stevens is the author of numerous articles on hydraulic engineering subjects, winning the Society's Norman Medal in 1937 for his paper on "The Silt Problem."

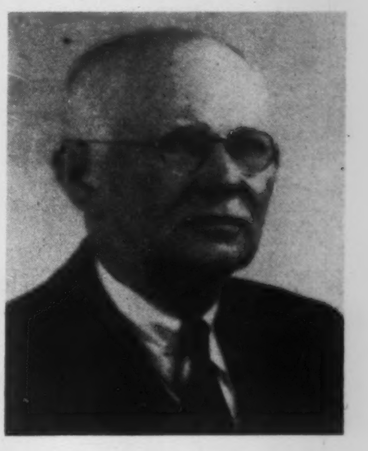
In addition to his consulting practice, he is the inventor of many engineering instruments and is senior partner in the firm of Leupold and Stevens Instruments that manufactures them—all recorders, remote registering systems, and controls bearing the name "Stevens," and all surveying and navigation instruments bearing the name "Leupold." Practically all the firm's work in recent years has been devoted to production for war material.

Long active in the Society, he served as Director from 1932 to 1934. For ten years he was secretary of the Society's Special Committee on Irrigation Hydraulics, and has also been chairman of the Special Committee on Hydraulic Research during the past ten years. His other affiliations include membership in the American Institute of Electrical Engineers and the Professional Engineers of Oregon, of which he is a former president.

ARMOUR C. POLK

ARMOUR C. POLK was born in Little Rock, Ark., in 1879, and was brought up in Texas. He graduated from the Ball High School at Galveston, Tex., and received a civil engineering degree from the Virginia Military Institute in 1899. After two years of railroad work in the Southwest, he entered Rensselaer Polytechnic Institute in the fall of 1901, receiving the degree of C.E. in 1903. From the latter year to 1911 he was employed on the construction of the Pennsylvania Railroad tunnels under the East River, New York; on public utility construction in New Orleans, La., and Mobile, Ala.; and on railroad location and construction in southwest Texas.

From 1911 to 1923 Mr. Polk was superintendent, district engineer, and construction manager for Sanderson and Porter on various utility projects, oil pipe lines, and hydroelectric projects throughout the United States. From 1923 to 1930 he was president of the Dixie Construction Company, of Alabama. During this period he had under his direction the construction of six hydroelectric dams, several hundred miles of transmission and distribution lines, steam electric stations, and similar utilities throughout the Southeastern States. In 1930 and 1931 he was vice-president of Allied Engineers of New York in charge of the construction of many hydroelectric and steam utilities in the eastern part of the United States.


ARMOUR C. POLK
Nominee for Vice-President, Zone II

Since 1930 Mr. Polk has been engaged in private practice as a consultant in general engineering matters in the Southeastern States, specializing in hydraulic, steam, electric, water, sewer, and heavy construction problems. During this period he designed and supervised the construction of the Birmingham Industrial Water Supply System, and was resident partner on the design and supervision of the Anniston Ordnance Depot and Camp Sibert for the U.S. Army and a number of smaller war projects in the South.

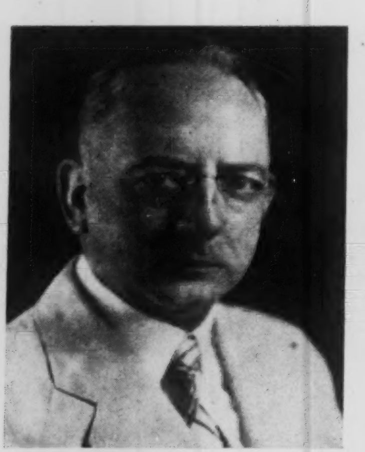
He became a Junior in the American Society of Civil Engineers in 1903, Associate Member in 1906, and Member in 1913. He was awarded the Thomas Fitch Rowland Prize in 1916, and he was Director from 1940 to 1942. Mr. Polk served in various offices in the Alabama Section and on many Society committees before and while he was on the Board of Direction. His other affiliations include membership in the American Institute of Consulting Engineers and the American Concrete Institute. He is a former president of the National Council of State Boards of Engineering Examiners, and chairman of the Alabama State Board of Registration for Professional Engineers and Land Surveyors. He is a registered engineer in the states of New York, Alabama, and Florida, and a colonel in the Corps of Engineers, U.S. Army Reserves, now on inactive status.

ERNEST E. HOWARD

ERNEST E. HOWARD was born in Toronto in 1880, and spent his early years in Canada. Graduating from the University of Texas in 1900, Mr. Howard taught there the following year. For the past 43 years he has been engaged in private consulting engineering practice, principally in the design of bridges and similar structures. Six of these years were with Waddell and Hedrick; seven years as principal assistant engineer with Waddell and Harrington; and thirty years in his successive firms of Harrington, Howard and Ash; Ash, Howard, Needles and Tammen; and Howard, Needles, Tammen and Bergendoff with offices in Kansas City, Mo., and New York. He has been identified with several hundred important bridge projects in many parts of the United States, Canada, and Mexico, and with some abroad. He was captain in the Corps of Engineers in the first World War but had no foreign service.

Following Pearl Harbor, his firm participated in war preparations. Their projects included the Southwestern Proving Ground, the Bluebonnet Ordnance Plant, additional facilities at Fort Riley, and similar work. For the past year extensive special design work has been carried on for the Engineer Board of the Army.

Supplementary interests and activities in education, in engi-



ERNEST E. HOWARD
Nominee for Vice-President, Zone III

neering archaeology, and in travel, and intimate association with many able engineers have contributed to a busy and interesting life. Since 1930 he has been chairman of the Board of Trustees of the University of Kansas City, of which he was one of the founders. In 1939 the University of Nebraska conferred on him the degree Eng.D. (honoris causa).

Elected a Junior in the Society in 1901, Associate Member in 1905, Member in 1913 and Life Member in 1940, he has been for many years active in Local Section affairs. From 1941 to 1943 Mr. Howard served as Director of the Society for District 16. His other affiliations include membership in the American Institute of Consulting Engineers, the Engineering Institute of Canada, the International Association for Bridge and Structural Engineering, the American Society of Mechanical Engineers, the Missouri Society of Professional Engineers, the Engineers Club of Kansas City, Phi Beta Kappa, and Tau Beta Pi. He is also a member of the Missouri State Board of Registration for Architects and Professional Engineers, having served since the board was first organized.

CHARLES W. BRYAN, JR

CHARLES W. BRYAN, JR., was born in Wilmington, Del., on January 20, 1890. He graduated from Washington University (St. Louis), with the degree of B.S. in Civil Engineering in 1912 and received the degree of C.E. from the same institution in 1922.

Immediately after graduation in 1912, Mr. Bryan became employed by the Patrick Ryan Construction Corporation and served for two years as construction engineer on foundation construction for the bridge and viaduct piers of the New York Connecting Railroad at Hell Gate. In 1914 he joined the Subway Construction Department of the United States Realty and Improvement Company as construction engineer and assistant superintendent on Sections 4 and 5 of the Seventh Avenue Subway. In the autumn of 1915, Mr. Bryan entered the employ of Fraser, Brace and Company, and for the following two years served as construction engineer on the installation of the New York Connecting Railroad bridge floors, on caisson construction at Grand Mère, Quebec, and on the building of a smokeless powder plant for the Imperial Munitions Board at Trenton, Ontario.

CHARLES W. BRYAN, JR.
Nominee for Director, District 1

In July 1917 he became construction engineer for the newly formed Federal Shipbuilding Company, and supervised the construction of that company's large and complete shipyard at Kearny, N.J. Since that time, Mr. Bryan has remained continuously in the employ of the Federal Company and has been associated with a wide variety of plant and industrial engineering work, including the manufacture of sea-going vessels, dredges, barges, and a number of structural and mechanical products. In 1934 he became assistant to the president of the Federal Shipbuilding and Dry Dock Company, and in 1936, vice-president in charge of sales and engineering activities. In that capacity Mr. Bryan has charge of the contracting activities of the company, as well as the supervision of the various branches of engineering entering into the design and construction of ships.

He became a Member of the Society in 1925, and has been active in the affairs of the Metropolitan Section, serving as director, vice-president, and as chairman and member of several of its various committees. He is a former president of the Society of Terminal Engineers and past-chairman of the New York section of the American Welding Society. Included among his other affiliations is membership in the Society of Naval Architects and Marine Engineers, the Society of Naval Engineers, the American Iron and Steel Institute, the Maritime Exchange, and the Engineers' Club of New York.

THORNDIKE SAVILLE

THORNDIKE SAVILLE was born in Malden, Mass., in 1892, and attended Harvard University from 1910 to 1913, majoring in civil engineering. Completing his requirements for the degree in three years, he returned to receive his A.B. with his class in 1914. During the academic year 1913–1914 he was a student in the Thayer School of Engineering of Dartmouth College, majoring in civil engineering, and received his B.S. degree Magna Cum Laude in 1914. In 1915 he received the professional degree of C.E. from Dartmouth and from that year to 1917 was a graduate student at the Massachusetts Institute of Technology and Harvard University. Upon leaving college in 1917 to enter the army, he was awarded the M.S. degree by both Harvard and M.I.T. Clarkson Institute of Technology conferred on him the honorary degree of doctor of engineering in 1944.

THORNDIKE SAVILLE
Nominee for Director, District 1

From 1917 to 1919 Dean Saville served, first, as second lieutenant in the Coast Artillery Corps and, later, as first lieutenant in the Signal Corps, U.S. Army. In 1919 he was in England and France, investigating river regulation and sewage treatment processes as Sheldon Travelling Fellow from Harvard University. From 1919 to 1932 he was associate professor and, then, professor of hydraulic and sanitary engineering at the University of North Carolina. Since the latter year he has been professor of hydraulic and sanitary engineering at New York University, and since 1936 he has been dean of the college of engineering there. While on the faculty of the University of North Carolina, he served as chief engineer of the North Carolina Geological Survey and its successor, the North Carolina Department of Conservation and Development. He was in charge of the Water Resources and Engineering Division.

Dean Saville has inaugurated and carried out numerous research projects and has had many articles published in standard engineering periodicals and journals. He has also been retained as consulting engineer in connection with various water power and water supply developments and hydrological investigations and condemnation suits. He has served the Rockefeller Foundation as consulting engineer to the government of Venezuela, and has been consultant to the Board on Beach Erosion and Sand Movement of the U.S. Army and to the U.S. Geological Survey and the Mississippi Valley Committee on Investigation of Flood Frequencies. He has also been a member of the U.S. Beach Erosion Board, Office of the Chief of Engineers, U.S. Army, since its establishment in 1930.

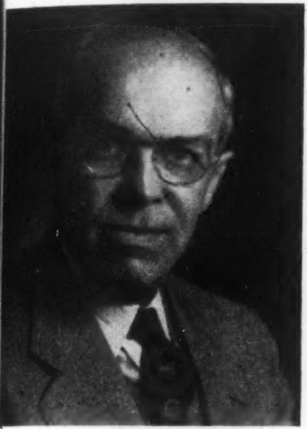
During Dean Saville's professional career he has been associated with the following organizations: American Society of Civil Engineers (secretary, North Carolina Section, 1922–1932; director and vice-president, Metropolitan Section, 1937–1942, and president, 1942–1943); American Water Works Association (secretary, North Carolina Section 1921–1926); New England Water Works Association; Boston Society of Civil Engineers; American Institute of Consulting Engineers; American Institute of Aeronautical Sciences; American Association for the Advancement of Science vice-president, 1942–1943); Federations of Sewage Works Associations; and the American Society of Planning Officials. He was chairman of the Project Review Committee and a member of the Water Resources Committee of the National Resources Planning Board from 1935 to June 1942.

HOWARD T. CRITCHLOW

Howard T. Critchlow was born in Prospect, Pa., on February 24, 1885. He received his early education in the public schools and graduated from Duff's Business College in Pittsburgh in 1904. The next two years he attended Geneva College and then entered Cornell University, from which he received the degree of C.E. in 1910.

From 1910 to 1914 Mr. Critchlow was employed on the construction of the Panama Canal as field, district, and principal hydrographer. From May 1914 to July 1915 he was assistant engineer for the Water Supply Commission of Pennsylvania, compiling a gazetteer of streams of that state, which was published as Part III, Water Resources Inventory Report. He then spent a short period with the U.S. Geological Survey on stream gaging work in Wisconsin and Minnesota, after which came two years as instructor and graduate student in Cornell University.

In April 1917 Mr. Critchlow accepted appointment as hydraulic engineer for the New Jersey Department of Conservation and Development, and in July 1924 was made chief of the Division of Waters. During 1924 and 1925 he was also consulting engineer to the New Jersey Delaware River Treaty Commission, advising on the technical problems involved in drafting a proposed compact as to the development of the water resources of the Delaware River by the states of New York, New Jersey, and Pennsylvania. In 1929 he was transferred to the newly created New Jersey State Water Policy Commission as division engineer, and in 1933 was promoted to chief engineer, which position he still holds. In this latter capacity he is administrative officer responsible for engineering work on water supply, dams, encroachments on stream channels, flood control, and surface and ground-water investigations. Numerous administrative and technical reports covering these activities have been issued.



Howard T. Critchlow
Nominee for Director, District 4

Mr. Critchlow's other services have included that of technical adviser to the Attorney General of New Jersey on the Delaware River Diversion Case before the U.S. Supreme Court; regional coordinator for the National Resources Committee on the Drainage Basin Study; and membership on a committee appointed to report on the utilization of the Delaware and Raritan Canal for a potable water supply. At present he is a member of a committee appointed to convert the canal into an industrial water supply. He is also the New Jersey member of the Committee on Quantity, Interstate Commission on the Delaware River Basin.

He joined the American Society of Civil Engineers in 1912 as a Junior, and became an Associate Member in 1914 and a Member in 1927, and has served as director and president of the Philadelphia Section. Mr. Critchlow's other affiliations include membership in the American Water Works Association (he was chairman of the 4-States Section in 1932), the American Geophysical Union, the Engineers Club of Philadelphia, the Engineers Club of Trenton (president in 1933), the New Jersey Health and Sanitary Association, and the New Jersey Society of Professional Engineers.

JOHN H. GARDINER

John H. Gardiner was born in Philadelphia, Pa., on October 15, 1894. He attended the Tucson High School and received his engineering degree from the University of Arizona in 1918 in absentia. He enlisted in the first World War in August 1917, served in France, and returned to Arizona from overseas in May 1919.

In 1919 and 1920 he was engaged on irrigation canal construction as construction engineer, followed by a period of highway construction work, and in late 1920 and 1921 he was engaged on railroad location in Mexico. In 1922 he was appointed junior engineer in the U.S. Geological Survey and assigned to stream-gaging work in Arizona. In August 1929 he was sent to Fort Smith, Ark., where he served as district engineer for the Geological Survey in full charge of the stream-gaging work then being initiated in the states of Arkansas and Oklahoma, and of the work on the Mississippi River at Memphis. Since April 1938 he has been in Tucson, Ariz., as district engineer for the Geological Survey in charge of stream-gaging work and hydraulic investigations in Arizona and the lower Colorado River Basin.

John H. Gardiner
Nominee for Director, District 11

During this period Mr. Gardiner has also served on various governmental and civic technical committees, contributed papers to engineering and water works associations, supervised and directed various technical reports, and supervised investigational projects relating to storm runoff and water use.

Mr. Gardiner became a Junior in the American Society of Civil Engineers in 1923, Associate Member in 1926, and Member in 1936. He served as secretary, vice-president, and president of the Mid-South Section during the period, 1934–1937, and in 1941–1942 he was president of the Arizona Section. He has been Contact Member for the University of Arizona Student Chapter (1938–1941), has served on the Arizona Local Membership Committee since 1939, and has been a member of the Committee on Juniors since 1942. He is also a member of various other technical and social organizations and clubs.

HARRY F. THOMSON

Harry F. Thomson was born in Cincinnati, Ohio, on October 6, 1887, but has spent most of his life in St. Louis. After graduating from the engineering school of Washington University in 1910, he did graduate work at Massachusetts Institute of Technology. From 1912 to 1914 he served as secretary of electrical engineering research at Massachusetts Institute of Technology and cooperated with Dr. Harold Pender as assistant editor-in-chief in the preparation of the original edition of the *American Handbook of Electrical Engineering* (Wiley, 1914).

He returned to St. Louis late in 1914 to become associated with the Provident Chemical Works, successively as assistant superintendent, Eastern manager in New York City, sales manager, and (from 1920 to 1924) vice-president. In 1924 Mr. Thomson moved to Birmingham, Ala., as executive assistant of the Federal Phosphorus Company. In 1927 he returned to St. Louis as vice-president of the newly organized General Material Company, which was among the pioneers in producing commercial ready-mixed concrete, and he has continued with that organization to the present. In addition, from 1936 to 1943, he served as water consultant for the National Resources Planning Board. Mr. Thomson is also a director of the Safety Mutual Casualty Insurance Company, St. Louis.

He became an Associate Member of the American Society of Civil Engineers in

Harry F. Thomson
Nominee for Director, District 14

1928 and a Member in 1939. He served as president of the St. Louis Section in 1940, and is at present chairman of the Section's Postwar Construction Committee. He has also held memberships in the American Institute of Chemical Engineers, the American Institute of Electrical Engineers, and the Society of Automotive Engineers. Recently the American Concrete Institute reelected him director-at-large. He was president of the National Ready Mixed Concrete Association from 1933 to 1935, and has since served as director and chairman of various committees. He is a registered professional engineer in Missouri.

Mr. Thomson has been active in the civic affairs of St. Louis, having served as director of the St. Louis Chamber of Commerce and vice-chairman of the local C.E.D. organization. He has cooperated actively with the federal emergency and wartime agencies, these services including membership on the Advisory Committee, Office of Defense Transportation, for the St. Louis region; chairmanship of the National Advisory Committee for the Ready-Mixed Concrete Industry, Office of Price Administration; and panel member for industry of the Regional War Labor Board.

He is a retired lieutenant commander of the Civil Engineering Corps Reserve of the U.S. Navy. As an author, he has contributed numerous articles to the technical press, as well as the chapter on ready-mixed concrete in *Pit and Quarry Handbook.*

OSCAR H. KOCH

OSCAR H. KOCH was born in Union, Mo., in 1890. Following his graduation from the University of Missouri in 1910, he had various engineering assignments in Missouri. Since 1914 he has been a member of the firm of Koch and Fowler, consulting engineers of Dallas, Tex. During this thirty-year period, the firm has been engaged in all types of municipal engineering and residential subdivision work.

OSCAR H. KOCH
Nominee for Director, District 15

In addition, Mr. Koch has become recognized as an authority on city planning. Evidence of this is the plans that have been prepared for the Texas cities of Austin, Tyler, Lufkin, Lubbock, Abilene, and Monahans. During the recent war construction program, Mr. Koch acted as chief engineer for his firm on the design and construction of Camp Bowie at Brownwood, Tex., and air-force facilities in Texas, Colorado, and Arkansas.

He has served his community as Director of Public Works for the city of Dallas; vice-chairman of the Dallas City Plan Commission; president of the Dallas Technical Club; president of the Dallas Kiwanis Club; and director of the Dallas Chamber of Commerce. As a member of the educational committee of the Dallas Technical Club, he played a part in establishing the school of engineering at Southern Methodist University. In addition to these community services, he was vice-president of the American Engineering Council for nine years.

Mr. Koch has also been active in Society affairs. Becoming an Associate Member in 1919 and a Member in 1921, he served as vice-president of the Texas Section in 1928 and as president in 1931. He has also been chairman of various committees of the Texas Section, and the recent report of his Committee on Employment Conditions ranks as an outstanding contribution to the profession.

Alfred Noble Prize Goes to Electrical Engineer

THIS year the Alfred Noble Prize goes to W. R. Wilson for his paper entitled "Corona in Aircraft Electric Systems as a Function of Altitude," which was published in the April 1944 *Transactions* of the American Institute of Electrical Engineers. Presentation of the prize will take place at the winter meeting of the Institute, of which Mr. Wilson is an associate member, in January 1945. Mr. Wilson is in the Works Laboratory of the General Electric Company at Pittsfield, Mass.

The Alfred Noble Prize was established in 1929 through a fund contributed by engineering and other friends of Alfred Noble, one-time President of the American Society of Civil Engineers. The prize is awarded annually to a young member of one of the Four Founder Societies or the Western Society of Engineers for a published technical paper of exceptional merit.

Election of Officers for United Engineering Trustees, Inc.

UNITED Engineering Trustees, Inc., the joint agency of the four national societies of civil, mining and metallurgical, mechanical, and electrical engineers, has reelected F. Malcolm Farmer its president for the ensuing year. Mr. Farmer is vice-president and consulting engineer of the Electrical Testing Laboratories of New York, and an authority on electrical measurements, electrical insulating materials, and high voltage cables. He has represented the Institute of Electrical Engineers on the Board of United Engineering Trustees since 1937. He is a past-president of the American Institute of Electrical Engineers, of the American Society for Testing Materials, and of the American Welding Society; past chairman of the Engineering Foundation and of the Standards Council of the American Standards Association. He is a member also of the American Society of Mechanical Engineers, and of the Institution of Electrical Engineers (British). During the war he has been consultant to the Ordnance Department.

The United Engineering Trustees, Inc., was founded by charter in 1904 "to advance the engineering arts and sciences in all their branches, to further research in science and engineering, to maintain a free public engineering library, and to advance in any other manner the profession of engineering and the good of mankind." It administers properties valued at more than $4,000,000, consisting of the Engineering Societies Building, the Engineering Societies Library, which is the largest strictly engineering library in America, if not in the world, and endowment funds of the Engineering Foundation, the research organization of the engineering societies.

Other officers elected by the United Engineering Trustees, Inc., include Arthur S. Tuttle (Past-President and Hon. M. Am. Soc. C.E.), consulting engineer, as vice-president; Everett S. Lee, engineer in charge, General Engineering Laboratory, General Electric Company, as vice-president; George L. Knight, chairman of the Finance Committee; A. L. Queneau, chairman of the Real Estate Committee; Albert Roberts, treasurer; and C. R. Jones, assistant treasurer. John H. R. Arms, general manager of the corporation, continues as secretary.

Local Sections Conference to Precede Annual Meeting

A CONFERENCE of representatives of the 25 Local Sections in the eastern area will be held on Tuesday, January 16, 1945, the day preceding the opening of the Annual Meeting. This conference was originally scheduled for last July in Cleveland, Ohio, but was canceled at the express request of the Director of the Office of Defense Transportation, J. M. Johnson, M. Am. Soc. C.E.

The Local Section Conference will convene at the Engineering Societies Building at 33 West 39th Street, New York, N.Y. Agenda for this gathering will be printed in full in the January issue. The 25 Sections invited to participate are the following:

Buffalo
Central Ohio
Cincinnati
Cleveland
Connecticut
Dayton
District of Columbia
Indiana
Ithaca
Lehigh Valley
Maryland
Metropolitan
Michigan
Mohawk-Hudson
North Carolina
Northeastern
Philadelphia
Pittsburgh
Providence
Rochester
South Carolina
Syracuse
Toledo
Virginia
West Virginia

NOTES FROM THE CAPITAL

Occasional Information of Interest to Engineers, Observed by the Society's Washington Representative, and Believed Worthy of Wider Attention.

A Water-Utilization Treaty with Mexico

President Roosevelt transmitted to the Senate on February 15, 1944, with view to ratification, a treaty between the United States of America and the United Mexican States, signed at Washington, D.C., February 3, 1944, relating to the utilization of the waters of the Colorado and the Tijuana Rivers and of the Rio Grande from Fort Quitman, Tex., to the Gulf of Mexico. This treaty represents an attempt by the United States and Mexico to solve important water-right problems which have been found to be outside the adequacy of present treaties and conventions.

Of more pressing concern are the questions that relate to the waters of the Rio Grande and the Colorado River, the Tijuana being a much smaller international stream crossing the boundary south of San Diego, Calif. The information here presented has been gathered from sources believed to be impartial and represents a factual appraisal of the situation.

THE RIO GRANDE has a drainage area of about 172,650 sq miles, comprising parts of three states on the United States side and parts of four states on the Mexican side. The drainage area at Fort Quitman, Tex., 81 miles below El Paso, is 31,990 sq miles, 30,606 being in the United States and 1,384 in Mexico. Between Fort Quitman and the mouth, the drainage area is 140,660 sq miles, 61,260 being in the United States and 79,400 in Mexico. From El Paso to the mouth, the international boundary follows the river, the distance being about 1,200 miles.

QUESTIONS DEALT WITH IN THE TREATY

Questions of international interest above Fort Quitman were settled by a convention signed May 21, 1906, by which the United States agreed to deliver 60,000 acre-ft annually to Mexico for lands in the El Paso-Juarez Valley. The waters of the Rio Grande below Fort Quitman are dealt with in the present treaty. The irrigated and irrigable lands on the United States side are situated principally in the lower valley, and as the river forms the international boundary and water may be used on either side, the assurance of water is a treaty matter to be accomplished by allocations that will be agreed to by both countries, and by construction of works for the storage and regulation of the flow.

The Colorado River has a drainage area of 244,000 sq miles, of which 242,000 sq miles are embraced in parts of seven states of the United States, and 2,000 sq miles are in Mexico. In the lower part of its course, the river forms the international boundary for 18 miles and thence flows about 90 miles entirely in Mexico to the Gulf of California. No tributaries join the river in Mexico and a large area of irrigable land is wholly dependent upon diversion of water from the Colorado River.

The Colorado River Compact apportions the waters to the extent of 16,000,000 acre-ft annually between the upper and lower basin states of the United States, Lees Ferry being the point of division. The Compact provides that if water is required for delivery to Mexico, it shall be supplied first from any surplus above the 16,000,000 acre-ft, and second, any deficiency shall be made up equally from the supplies of the upper basin and the lower basin. The proposed Treaty specifies and guarantees the amount of water of the Colorado River which the United States shall be obligated to deliver annually to Mexico.

In the Colorado River Basin, Mexico is dependent on agreement with the United States to assure a water supply for its lands. In the lower Rio Grande Basin, the situation is essentially reversed: the United States is dependent on agreement with Mexico to assure a water supply for its lands because about 70% of the water below Fort Quitman comes from Mexican tributaries. The need for an agreement between the two governments concerning water rights on these rivers has been urgent for a long time. Such agreement is the principal objective of the Treaty.

The Treaty changes the name of the present International Boundary Commission to International Boundary and Water Commission, and materially extends its authority and power. The Commission consists of a United States Section and a Mexican Section, each headed by an Engineer Commissioner. The present United States Commissioner is L. M. Lawson, Hon. M. Am. Soc. C.E. The jurisdiction of the Commission extends to the parts of the Colorado River and the Rio Grande which comprise the boundary; to the land boundary; and to the works located on the common boundary. Each section retains jurisdiction over the part of the works located within the limits of its own country.

Part II, Article 4, of the Treaty provides for the allotment to the United States of the waters of the Rio Grande between Fort Quitman and the Gulf as follows:

1. All of the waters contributed to the main stream by seven named United States tributaries, chiefly by the Pecos and Devils rivers.
2. One-half of the flow in the Rio Grande below the lowest major international storage dam so far as this flow is not otherwise specifically allotted by the treaty.
3. One-third of the flow reaching this river from six named Mexican tributaries above the Alamo River, provided that this one-third shall never be less than 350,000 acre-ft each year as an average in 5-year cycles.
4. One-half of all other flows not otherwise allotted, occurring in the main channel of the Rio Grande, including contributions from tributaries not named in Article 4, between Fort Quitman and the lowest major international storage dam.

Thus, in addition to a general 50-50 division of waters in the main channel, there is allotted to the United States all the waters contributed to the main stream by seven named United States tributaries and one-third of the flow reaching the river from six named Mexican tributaries, provided that the average from Mexican tributaries in 5-year cycles shall not be less than 350,000 acre-ft per year. It is apparent that United States interests are substantially favored in this arrangement. The quantity thus allotted will, with conservation by storage and efficient use, supply present uses and permit considerable expansion of existing irrigated areas in the United States.

APPORTIONMENT OF COLORADO RIVER WATER

Part III prescribes rules that are to govern the allocation and delivery to Mexico of a portion of the waters of the Colorado River. The United States guarantees to Mexico a quantity of 1,500,000 acre-ft of water each year, this water to be delivered in accordance with schedules to be furnished in advance by the Mexican Section of the Commission, and, whenever the United States Section decides there is a surplus of water, an additional quantity up to a total, including the 1,500,000 acre-ft, of not more than 1,700,000 acre-ft per year.

In the event of extraordinary drought or serious accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-ft a year, the water allotted to Mexico will be reduced in the same proportion as consumptive uses in the United States are reduced. These waters of the Colorado River will be delivered by the United States in the boundary portion of the river, except that until 1980 Mexico may receive 500,000 acre-ft annually, and after that 375,000 acre-ft annually through the All-American Canal, as part of the guaranteed quantity.

Moreover, the United States will undertake, if the Mexican diversion dam is located entirely in Mexico, to deliver up to 25,000 acre-ft, at the Sonora land boundary near San Luis. Inasmuch as Mexican uses prior to the construction of Boulder Dam reached a maximum of 750,000 acre-ft per year, it appears that in the apportionment of the waters of the Colorado River, the arrangement is especially favorable to Mexico.

The Treaty also commits the two governments to programs for construction of certain dams. On the Rio Grande it is provided that there shall be constructed through the respective Sections of the Commission:

1. The dams required for the conservation, storage, and regulation of the greatest quantity of the annual flow of the river in a way to insure the continuance of existing uses and the development of the greatest number of feasible projects, within the limits imposed by the water allotments.

2. The dams and other joint works required for the diversion of the Rio Grande at sites and under specifications to be fixed by the Commission.

The cost of construction, operation, and maintenance of each of the storage dams shall be pro-rated between the two governments in proportion to the capacity allotted to each country. The similar cost of dams and other joint works required for diversion will be pro-rated between the two governments according to the benefits to be received therefrom.

In the Colorado River, Mexico agrees to construct at its expense a main diversion structure below the point where the northernmost part of the international land boundary line intersects the river. The Commission will maintain and operate the structure at the expense of Mexico. The United States agrees to construct and thereafter operate and maintain at its expense, the Davis storage dam and reservoir (heretofore projected by the Bureau of Reclamation), situated about 200 miles above Yuma, a part of the capacity of which shall be used to make possible the regulation at the boundary of the waters to be delivered to Mexico. The United States also agrees to construct or acquire in its territory works necessary for furnishing water to Mexico as contemplated by the Treaty. Such construction or acquisition, and the operation and maintenance of the works shall be carried out at the expense of Mexico.

Index for 1944 "Civil Engineering" in This Issue

All articles and items which have appeared in Volume 14 of CIVIL ENGINEERING have been indexed in the separate section which is included at the very back of this issue. The index is purposely printed in a separate form so that, when the volume is bound, the index can be placed in any position desired.

Separate copies of the index are available on request to Headquarters for 15 cents each.

Mexico will also pay to the United States a proportion of the costs incurred in the construction of Imperial Dam and the Imperial Dam–Pilot Knob Section of the All-American Canal, utilized in the diversion of some of the water allotted to Mexico, such proportion and the details of repayment to be determined by the two governments. Similarly, Mexico will share in the costs of maintenance and operation of such facilities. As an offset to this obligation, Mexico will share equitably in the benefits from any revenues from the sale of electric power generated at a drop at Pilot Knob.

The Treaty makes comprehensive provision with reference to investigational and construction activities pertinent to works for flood control and hydroelectric power development. In the international parts of both the Rio Grande and the Colorado River, the Commission will study, investigate, and prepare plans for flood control works and report to their respective governments the part of the works to be constructed by each government. After approval by the governments, the works will be constructed through the respective Sections of the Commission. (Apparently without Congressional action the United States is obligated to construct and pay the cost of such works assigned to the United States by the Commission, on penalty of violation of the Treaty.) Under the same conditions the Commission will also recommend the parts of the works to be operated and maintained by each Section, and in the Colorado River, also the parts to be operated and maintained jointly by the Commission.

Similarly, the Commission will, in respect to the Rio Grande, study, investigate, and prepare plans for plants generating hydroelectric energy which it may be feasible to construct at the international storage dams situated below Fort Quitman. Each government agrees to construct through its Section of the Commission such works as may be recommended by the Commission and approved by the two governments. The hydroelectric plants will be operated and maintained jointly through the respective Sections of the Commission. Each government will pay half the cost of the construction, operation, and maintenance of such plants, and energy generated shall be assigned equally to each country. (For the purposes of the Treaty and obligations under it, "The Government" appears to mean the President, with the advice and consent of the Senate, and large costs would be obligated without action by the House of Representatives.)

The Treaty contains the general provision that each Section shall have, to the extent necessary to give effect to the provisions of the Treaty, jurisdiction over the works constructed exclusively in the territory of its country whenever such works shall be connected with or shall directly affect the execution of the provisions of the Treaty. (This jurisdiction evidently may include the operation of such structures as Imperial Dam, All-American Canal, Davis Dam, and even Boulder Dam.)

As to the Rio Grande, the Treaty provides that the Commission shall keep a record of the waters belonging to each country and of those that may be available at a given moment, taking into account factors of storage, use, and loss. The Commission will contruct, operate, and maintain gaging stations on the main channel and each Section will construct, operate, and maintain gaging stations on the measured tributaries in its own country. The cost of construction of any new gaging stations in the main channel will be borne equally by the two governments. The cost of operation and maintenance of all gaging stations shall be apportioned between the two Sections in accordance with determinations to be made by the Commission. Similar provision is made with respect to gaging stations in the boundary portion of the Colorado River and on carrying facilities used for the delivery of water to Mexico.

The Treaty also provides generally that the Commission shall construct, operate, and maintain upon the boundary portions of the international streams, and each Section shall severally construct, operate, and maintain upon the parts of the international streams and their tributaries within the boundaries of its own country, such stream-gaging stations as may be needed to provide the hydrographic data necessary or convenient for the proper functioning of the Treaty.

A notable feature of the Treaty is the recognition of the jurisdiction of the Commission in relation to matters which by their nature require joint action, and the recognition of the jurisdiction of each Section of the Commission in relation to works and facilities exclusively in the territory of its country, when such works and facilities directly affect the execution of the provisions of the Treaty or are needed for the proper functioning of the Treaty. The Treaty, if ratified, will confirm, as a function of the respective Sections, the execution of great public works, requiring the cooperative efforts of the two governments. The jurisdictions of the Commission and the respective Sections overlap those of other administrative, investigative, and construction agencies, both federal and state. As to construction activities, it is provided that the Sections may make use of any competent public or private agencies in accordance with the laws of the respective countries.

The range and scope of the Treaty are novel, as illustrated by the following statement quoted from an article, "Water Treaty between the United States and Mexico," by Charles A. Timm, Divisional Assistant, Division of Mexican Affairs, U.S. Department of State Bulletin, March 25, 1944, pp. 282–292:

"Considered in the light of previous treaties relating to the use of water from international streams for various purposes, it is not improbable that the treaty of February 3, 1944, now awaiting action in the Senate, may come to be regarded as the most important of its kind in the history of the world, both in the range and scope of its provisions and in its social and economic significance. It is more than a mere division of water between two countries: it provides the administrative machinery and the principles for international cooperation in the development of these water resources. As such, it may well be taken as a model for future treaties governing international streams."

The nature of the powers conferred upon the International Boundary and Water Commission contrast interestingly with those conferred upon the International Joint Commission by the Boundary Waters Treaty of 1909 between the United States and Canada. That treaty created an international body to deal with water problems along the boundary between this country and Canada. Its powers are judicial, administrative, and investigative. It has no authority to construct engineering work. Its administrative and investigative functions have been and are exercised generally through existing government agencies on the two sides of the boundary, thereby promoting close coordination and tending to avoid duplication of activity and conflicts of authority.

On the other hand, it may have less of the advantages of the closer control that would come by operating through an administrative and technical staff of its own. Through this treaty, the international water problems as relating to Canada and the United States are settled in an amicable and satisfactory manner. It will be fortunate if the Treaty with Mexico can effect a similar happy solution of water problems on the southern boundary.

Hoover Medal Goes to Mechanical Engineer

Announcement has been made of the selection of Ralph E. Flanders, president of the Federal Reserve Bank of Boston, as the seventh recipient of the Hoover Medal. The Medal was presented to Mr. Flanders on November 29 at the annual dinner of the American Society of Mechanical Engineers, of which he is a member and past-president. The citation accompanying the award reads, "Engineer, industrialist, humanist, whose faith in his fellow-men and devotion to human well being, as exemplified by effective public service and inspired leadership, have led to the award of the Hoover Medal for 1944."

Born in Vermont in 1880, Mr. Flanders' early experience in machine design and construction was received at the Brown and Sharpe Manufacturing Company, the Taft-Pierce Manufacturing Company, the International Paper Box Machine Company, and the General Electric Company. In 1912, after four years as associate editor of *Machinery* and two years as sales engineer with the Fellows Gear Shaper Company, he joined the Jones and Lamson Machine Company, as manager of the Fay Lathe Department. In 1914 he was made general manager, and in 1933 president of the company. In May 1944 he was granted a leave of absence from the Jones and Lamson Machine Company to serve as president of the Federal Reserve Bank of Boston. Regarded as a national authority on machine design and construction, especially on the engineering problems of screw threads and thread grinding, Mr. Flanders is the recipient of numerous honorary engineering degrees.

Established in 1930 in honor of Herbert Hoover, the Medal is administered by the Hoover Medal Board of Award, consisting of representatives of the Four Founder Societies. Previous recipients have been Herbert Hoover, Ambrose Swasey, and John F. Stevens, all Honorary Members of the Society; Gano Dunn, M. Am. Soc. C.E.; and D. Robert Yarnall and Gerard Swope.

Fred W. Stiefel Wins Construction Prize

This year the Construction Engineering Prize—awarded annually for the best original scientific or educational paper on construction published in Civil Engineering—goes to Fred W. Stiefel, Assoc. M. Am. Soc. C.E., for his article, "Inclined Mine Shaft Sunk in the Adirondacks," which was published in the April 1944 number.

The prize is being given for the sixth time, having been established in 1939 through the generosity of A. P. Greensfelder, M. Am. Soc. C.E. It is the only prize specifically limited to material appearing in Civil Engineering. Mr. Stiefel will receive the award at the time of the Annual Meeting in January.

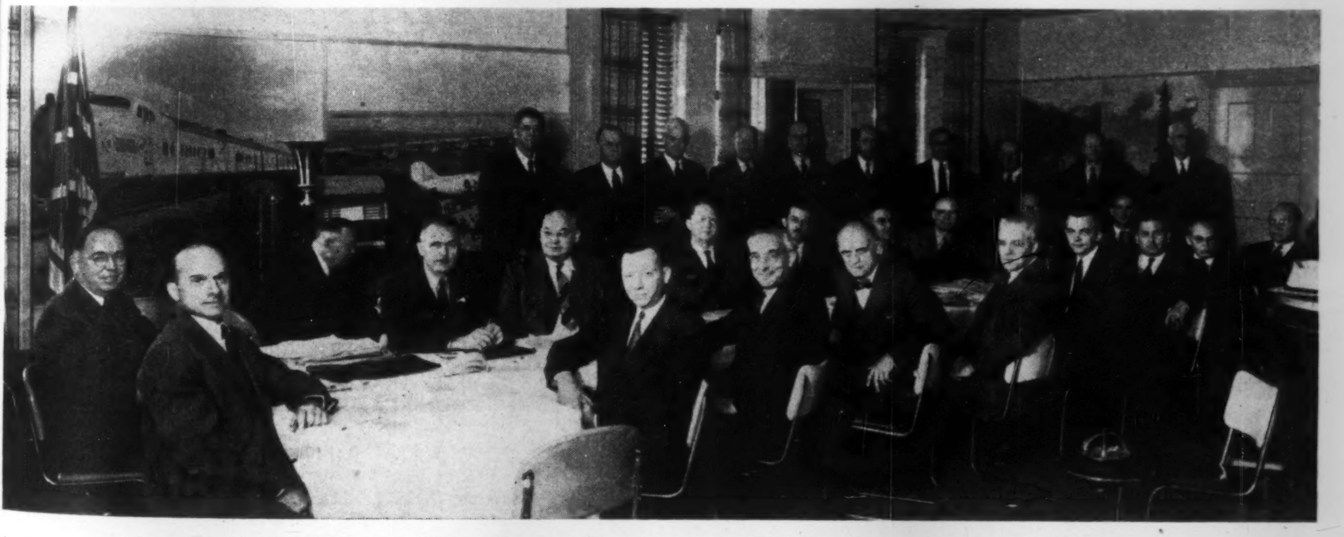
Local Section Problems Discussed in Denver

Fifteen Local Sections of the Society were represented at a conference in Denver, Colo., on October 10, 1944. The primary purpose of the session was the discussion of the wartime needs of the members of Local Sections—both resident and in the service. One of the pressing needs mentioned was the maintenance of contact with members in the armed forces and the provision for the reemployment of these members on their return. Representative of the discussions presented was that of R. Robinson Rowe, Secretary-Treasurer of the Sacramento Section. Mr. Rowe's account is printed on page 534 of this issue.

As was to be expected, during the course of the conference, attention was called to the recent activities of the Society in attempting to make it unnecessary for professional engineering employees to join with sub-professional groups in union activities. The experiences of the Sections represented were related. One of the longer discussions presented was that by Alfred L. Miller, president of the Seattle Section.

Delegates attending this conference were:

Thomas M. Lowe	Alabama
R. L. Downing	Colorado
C. L. Eckel	
A. J. McNair	
H. L. Potts	
Warren Raeder	
A. O. Ridgway	
Clarence Rawhouser	
A. J. Ryan	
W. L. Chadwick	Los Angeles
A. Diefendorf	Intermountain
Donald Bondurant	New Mexico
R. R. Clark	Oregon
R. Robinson Rowe	Sacramento
L. W. Deewall	San Diego
T. J. Corwin, Jr.	San Francisco
A. L. Miller	Seattle
E. C. Jensen	Spokane
C. A. Strong	Tacoma
J. A. Focht	Texas
C. W. Okey	Tennessee Valley
P. A. Upp	Wyoming



Delegates Meet for Local Section Conference at Denver, Colo., October 10, 1944
Representatives from All Sections on the Pacific Coast, and Others Eastward to Colorado and Texas, Are Shown Seated. Standing Are Society Officers and Guests

Sacramento Section Maintains Contact with Members in Service

By R. ROBINSON ROWE, M. AM. SOC. C.E.
SECRETARY-TREASURER, SACRAMENTO SECTION

Recognizing the value which men in service place upon contacts with home, the Sacramento Section keeps up-to-the-minute records of each member's location. Also the day when they all come home from the war is anticipated, and provisions are being worked out to assist in reemployment of all as they return. This account has been prepared by Mr. Rowe, based on his report at the Local Section Conference in Denver.

THE DISTINCTION between civil and military engineers being one of application rather than one of theory, the civil engineer in time of war turns to military works as readily as the military engineer in his turn builds improvements to rivers and harbors in time of peace. The mechanical and logistic requirements of the current war have exceeded by far all previous demands upon our profession—so much so that more than 5,000 members of the American Society of Civil Engineers have entered military service.

CIVIL ENGINEERING has already reported the effect of this mobilization on the administration of Society affairs (August 1944, issue, p. 369). Except for special attention to a few unusual cases, this administration perforce has to be confined to impersonal attention to frequent changes in address and regulated exemptions from dues.

In the Local Sections of the Society, by contrast, the problems become more personal because of mutual acquaintanceships in the smaller groups within limited areas. Officers and committees of the Sections have had an opportunity, if not a resonsibility, to give individual attention to several very important matters.

First in point of time is the maintenance by correspondence of benefits derived from membership in Local Sections. These benefits, of course, will vary with the size, compactness, and policy of the Section. This is the current problem, but plans should be under way for the sequel problem—return to civil employment.

The Sacramento Section is so organized that it has had an unusual opportunity to serve its members in uniform. Although its assigned area is 74,000 sq miles, 287 of its 431 members are (or were before entering service) residents of Sacramento County. In a population of 170,000, this is an extraordinary concentration of civil engineers, explained by the coincidence of three federal headquarters (USBR, USED, and USGS) with a state capital.

Weekly meetings have made the Section something of a club. The informality permitted at these meetings, and encouraged on particular occasions, has developed many friendships and wide acquaintanceships. Naturally, these interests have continued after the departure of some for military service.

To satisfy this continued interest, the Section's monthly program announcement, *Engineerogram*, has developed more and more space to the activities of those in service. Promotions, assignments, addresses, and interesting experiences are printed regularly as received. At least once a year, the current addresses are summarized in a directory.

Collection of these data has been a real problem. Less than half of our service members advise the Section's Secretary of changes in address or rank. For the others, a change is usually announced by a return of *Engineerogram*, for which we guarantee postage. Anticipating such returns, the Secretary has catalogued telephone numbers of friends or relatives so that the next issue will not only be correctly addressed, but will include a news item for the information of others.

Of 70 members sent overseas, 25 have requested that we use a permanent home address. For the other 45 giving APO and FPO addresses, *Engineerogram* is posted first class. Since it is forwarded through address changes, we do not have returns to warn us of those changes. So we have adopted a policy with respect to all members in service, of inquiring from friends and relatives about anyone for whom no news item has appeared in the past six months.

For this purpose, the Secretary maintains a roster of all men in service, with columns ruled for each month. As news items appear in *Engineerogram*, check-marks are struck in the proper column. Each month, a week before the deadline, a list is compiled of those not reported in six months. Personal inquiry, mostly by telephone, is then made through the catalogued sources.

Another very helpful source, particularly as to members who do not correspond with Sacramentans, is the monthly list of address changes sent from Headquarters to Local Section secretaries.

The development of the problem over a period of five years is illustrated by Fig. 1, which relates the number of members in service to the assigned, subscribing, and total memberships. Annual breaks on the two latter graphs are due to our provision for dropping at each year's end those who did not pay that year's dues.

The graph of members in service is remarkable for the steady mobilization from October 1940 to August 1942, followed by a period of seven months in which half of the total was recruited. Apparently the peak was passed at D-day.

Also remarkable is the gain in subscribing and total membership in 1943–1944 without a corresponding gain in assigned membership. Since April 1943, the number paying local dues has exceeded the number assigned—a paradox due partly to the non-assignment of members using APO and FPO addresses, but largely, we believe, to the number of former residents of Sacramento who value the service news of *Engineerogram*.

It should be noted that we carry on our rosters not only the assigned members and others paying dues, but also all who were on the Section roster when they entered service. In most cases this is proper because of military leave, such that the member will return to a position held for him. But members already in service when assigned to our area are carried on the roster just during such assignment. There are very few of these.

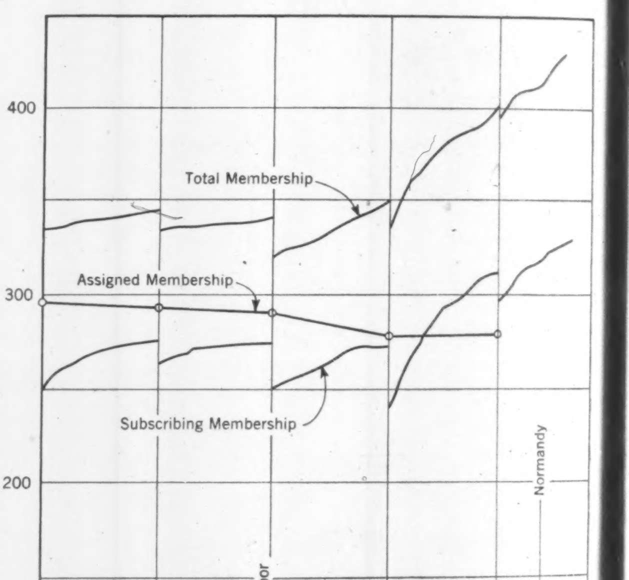


FIG. 1. BREAKDOWN OF SACRAMENTO SECTION'S MEMBERSHIP, 1940–1944

Inconspicuous at the bottom of Fig. 1 is the beginning of a graph of members returned. So far, these have returned to positions held for them; reemployment would not have been difficult in any event. Reemployment of the others as they return will not be as simple.

Anticipating this problem, the Sacramento Section has set up a Reemployment Committee of eight members, selected to represent the larger engineering organizations. The committee has been directed to survey reemployment needs. The survey will determine how many have positions waiting for them and how many others can be helped by a reemployment service.

It is expected that the reemployment service will be most needed by the Juniors that went directly from college into service and that the hazard of unemployment will be greatest one or two years after the war is over. By that time, war savings will be spent. Consequently, the Section has made this committee the administrator of its Unemployment Fund.

Sacramento Section expects to record, in its first year book after the war, a summary of the military service of its members. The data being obtained now from continued correspondence and inquiry will be available for that purpose. It is suggested that, with the help of the other Sections, the Society publish a more complete memorial, for few if any professions have been called into defense of the nation in greater proportion.

Engineering Foundation Elects Officers

At its annual meeting held on October 19, the Engineering Foundation reelected A. L. Queneau, Metallurgist of the U.S. Steel Corporation, as chairman for the ensuing year. A. B. Kinzel, Chief Metallurgist of Union Carbide and Carbon Research Laboratories, Inc., was elected vice-chairman; Edwin H. Colpitts, formerly director of the Bell Telephone Laboratories, was reelected Director; and John H. R. Arms was reelected Secretary.

The Research Procedure Committee will be composed of L. W. Chubb, of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.; E. A. Prentis, Jr., of Spencer, White & Prentis, Inc.; Prof. H. E. Wessman, M. Am. Soc. C.E., of New York University; W. M. Peirce, of the New Jersey Zinc Company; Prof. W. Trinks, of Carnegie Institute of Technology; and Dr. W. A. Lewis, of Cornell University. Mr. Queneau will represent the Engineering Foundation on the Executive Board of the National Research Council.

Seven Researches, many of importance to war work, were conducted during the year just closed covering the various fields of engineering. These projects included work on Soil Mechanics and Foundations, Critical-Pressure Steam Boilers, Unsteady Heat Flow Investigations, and Plastic Flow of Metals. These studies were carried on in cooperation with the Welding Research Council, the Engineers' Council for Professional Development, and the National Academy of Sciences.

The Engineering Foundation (29 West 39th Street, New York 18) was established in 1913 for "the furtherance of research in science and engineering and for the advancement in any other manner of the profession of engineering and the good of mankind."

First Award of J. C. Stevens Prize

The J. C. Stevens Award, which was established in 1943, has been presented for the first time for the year 1944, to Boris A. Bakhmeteff and Nicholas V. Feodoroff. This award is to be given each year to the member of the Society submitting the best discussion of a paper published in Transactions in the field of hydraulics.

Adjudged best for that year by the executive committee of the Hydraulics Division was the discussion by Messrs. Bakhmeteff and Feodoroff, of Paper 2186, which appears in Vol. 108 of Transactions. This paper, entitled "Profile Curves for Open-Channel Flow," was written by Dwight F. Gunder, Assoc. M. Am. Soc. C.E.

The prize consists of books costing not more than $50, to be selected by the recipients. In the front of each book will be placed a book plate setting forth facts regarding the award, signed by the President and Secretary of the Society. This prize will be bestowed at ceremonies held during the Annual Meeting in January 1945.

E.C.P.D. Elects Officers at 1944 Annual Meeting

On October 20 and 21, the annual meeting of the Engineers' Council for Professional Development was held in the Engineering Societies Building in New York. The present chairman and vice-chairman were reelected. The chairman is E. S. Lee, engineer of the General Engineering Laboratory, General Electric Company, Schenectady, N.Y.; and the vice-chairman is James W. Parker, who is president, general manager, and director of the Detroit Edison Company. For secretary the choice was R. L. Sackett, M. Am. Soc. C.E., assistant to the Secretary of the American Society of Mechanical Engineers; and for assistant secretary, George T. Seabury, Secretary of the American Society of Civil Engineers.

For the chairmen of E.C.P.D.'s committees, the following were elected:

Committee on Student Selection and Guidance	A. R. Cullimore, President, Newark College of Engineering
Committee on Engineering Schools	D. B. Prentice, President, Rose Polytechnic Institute
Committee on Professional Training	C. A. Pohl, M. Am. Soc. C.E., consulting engineer, New York
Committee on Professional Recognition	N. W. Dougherty, M. Am. Soc. C.E., Dean of Engineering, Univ. of Tenn.

Representatives to E.C.P.D. appointed by the constituent bodies were announced as follows (Messrs. Chedsey, Parker, and Kirkpatrick being reappointments):

S. C. Hollister, Am. Soc. C.E.
W. R. Chedsey, A.I.M.E.
J. W. Parker, A.S.M.E.
E. C. Stone, A.I.E.E.
S. D. Kirkpatrick, A.I.Ch.E.
H. S. Rogers, S.P.E.E.
C. J. Mackenzie, E.I.C.
Carl L. Svensen, N.C.S.B.E.E.

Serving on the Executive Committee of E.C.P.D. for the coming year will be, in addition to the chairman, vice-chairman, secretary, and assistant secretary:

G. W. Burpee, Am. Soc. C.E.
W. B. Plank, A.I.M.E.
R. L. Goetzenberger, A.S.M.E.
O. W. Eshbach, A.I.E.E.
S. D. Kirkpatrick, A.I.Ch.E.
D. B. Prentice, S.P.E.E.
C. R. Young, E.I.C.
C. C. Knipmeyer, N.C.S.B.E.E.

At the annual banquet on Friday evening, October 20, E. S. Lee presided, and the principal address was delivered by Dr. George Granger Brown, chairman, Department of Chemical and Metallurgical Engineering, University of Michigan. His subject was "What Is Ahead in Engineering Education?" The address was discussed by Dean C. R. Young, M. Am. Soc. C.E., of the University of Toronto, from the Canadian viewpoint; by George W. Burpee, M. Am. Soc. C.E., of New York, from industry's viewpoint; and by Col. C. E. Davies, Secretary of A.S.M.E., from the viewpoint of the engineering societies.

The Engineers' Council for Professional Development is a conference of engineering organizations, formed to enhance the professional status of engineers through cooperative effort. Its constituent organizations are:

- American Society of Civil Engineers
- American Institute of Mining and Metallurgical Engineers
- American Society of Mechanical Engineers
- American Institute of Electrical Engineers
- American Institute of Chemical Engineers
- Engineering Institute of Canada
- Society for the Promotion of Engineering Education
- National Council of State Boards of Engineering Examiners

Members of Staff Active Red Cross Blood Donors

The Society is taking part in the war effort in more ways than one, and members of the staff at Headquarters have been active in the "home front" services that support the fighting men. One of the most vital of these services is the contribution of blood to the American Red Cross.

In less than two years some twenty-five members of the staff, or over one-third of the total of sixty, have made at least one and, in most cases, several donations. And four of this number—two men and two women—now belong to "The Gallon Club," indicating that they have contributed eight pints or more to the blood bank.

Several other members of the staff have volunteered but have not been able to meet the rigid requirements. In view of the current attempt to amplify this vital service throughout the country, the cooperation of the office staff gains in importance. The regular blood donations are continuing.

"Civil Engineering" to Be Sent to Foreign Libraries by American Library Association

CIVIL ENGINEERING will be sent to libraries throughout the war-torn countries by the Committee on Aid to Libraries in War Areas of the American Library Association. Both CIVIL ENGINEERING and PROCEEDINGS were added to the list of 325 technical and scholarly publications chosen for this distribution by specialists. This group attempted to cover various fields of knowledge in which recent developments will be of value to liberated technicians and professional people. Funds for the collection and distribution are provided by the Rockefeller Foundation, which has allotted from $50,000 to $70,000 annually for this purpose since 1941.

Originally the committee was formed to study ways in which libraries in this country could help similar institutions abroad in their struggle with wartime conditions, and especially to find some means of preserving for later distribution U.S. publications not available because of the war. The Rockefeller grant has enabled the committee to implement its findings. In the case of periodicals, several factors influence orders placed for each title: the journal's foreign circulation before the war, the ratio of foreign circulation to total circulation, the number of free or exchange subscriptions, the number of copies available through gifts from subscribers in this country, and the relative importance of the journal to research.

The committee's periodical purchases are supplemented by gifts. In this way current issues and back files of important periodicals have been secured for use in restocking libraries that have been damaged or destroyed. Free storage space is difficult to obtain, however, and whenever possible donors are urged to store materials until central storage space is available. Transportation costs are paid, but material accepted for storage is limited to what seems of first importance. Gifts are being stored in a number of libraries in all parts of the country, and offers of additional storage space are always welcome.

Prospective donors are asked to report titles and dates of the journals available to the office of the committee. Shipping instructions will then be issued, indicating where and how shipment should be made. The committee has prepared three lists of desirable periodicals, which are available on request—a general list, a list of medical journals, and a list of technical periodicals. All inquiries should be addressed to the Committee on Aid to Libraries in War Areas, Library of Congress Annex, Study 251, Washington, D.C.

Expansion at Headquarters

THROUGH recent rearrangement of its offices, the Society now occupies the entire two upper floors of the Engineering Societies Building. These floors were added when the Society joined the other Founder Societies in 1916. At that time, however, and subsequently, the Society used only a part of the sixteenth floor in addition to the entire fifteenth floor.

As need subsequently arose, more and more space was taken. The desire for the present change has been felt for some years, but the crowded condition of the building and the convenience of other occupants has prevented the necessary enlargement.

In particular, the Membership Department, the Accounting Department, and the Publications Department felt that they needed more elbow room. Accordingly some offices were moved, some were subdivided and enlarged, and some were made more comfortable by the transfer of crowded personnel. The result is a much more desirable arrangement of facilities with a moderate amount of provision for possible extension of activities. It is believed that no further material changes will be needed for a number of years.

News of Local Sections

Scheduled Meetings

ALABAMA SECTION—Two-day meeting at the Thomas Jefferson Hotel in Birmingham, Ala., on December 15, at 10 a.m.

CLEVELAND SECTION—Dinner meeting in the Cleveland Engineering Societies Building on December 15, at 6:30 p.m.

COLORADO SECTION—Dinner meeting at the Edelwiess Restaurant on December 11, at 6:30 p.m.

DAYTON SECTION—Luncheon meeting at the Engineers' Club on December 18, at 12:15 p.m.

DISTRICT OF COLUMBIA SECTION—Joint meeting with the A.I.E.E. on December 12, at 8:15 p.m.

ILLINOIS SECTION—Luncheon meeting at the Chicago Engineers' Club on December 15, at 12:15 p.m.

ITHACA SECTION—Joint dinner meeting with the Steuben Area Chapter of the S.P.E., at the Elmira S.P.E. on December 14, at 7 p.m.

KANSAS CITY SECTION—Dinner meeting in the Pine Room, Union Station, on December 8, at 6:30 p.m.

KENTUCKY SECTION—Dinner meeting at the Canary Cottage, Louisville, on December 15, at 6 p.m.

LEHIGH VALLEY SECTION—Annual dinner meeting on December 11, at 6 p.m.

LOS ANGELES SECTION—Dinner meeting at the University Club on December 13, at 6:45 p.m.

MARYLAND SECTION—Dinner meeting at the Engineers' Club on December 14, at 6 p.m.

METROPOLITAN SECTION—Technical meeting in the Engineering Societies Building on December 20, at 8 p.m. (Lt. Gen. Brehon Somervell is scheduled to talk on "Current Problems in Army Service Forces.")

MIAMI SECTION—Dinner meeting at the El Comodoro Hotel on December 7, at 7 p.m.

MOHAWK-HUDSON SECTION—Smoker at the Rensselaer Poly. Inst. Club House on December 19, at 8 p.m.

NEBRASKA SECTION—Dinner meeting at the University Club, Lincoln, on December 12, at 6:45 p.m.

NEW MEXICO SECTION—Dinner meeting at La Fonda Hotel, Santa Fe, on December 19, at 7:30 p.m.

NORTH CAROLINA SECTION—Dinner Meeting in Winston Salem on December 11, at 6:30 p.m.

NORTHWESTERN SECTION—Dinner meeting at the Campus Club, University of Minnesota, on December 4, at 6:30 p.m.

PHILADELPHIA SECTION—Dinner and meeting at the Engineers' Club on December 12. Dinner at 6 p.m.; meeting at 7:30 p.m.

ST. LOUIS SECTION—Annual meeting at the Coronado Hotel on December 2, at 6:30 p.m.

SAN FRANCISCO SECTION—Annual meeting at the Engineers' Club of San Francisco on December 19, at 5:30 p.m.

SPOKANE SECTION—Annual luncheon meeting at the Davenport Hotel on December 9, at 12 m.

TENNESSEE VALLEY SECTION—Meeting of Chattanooga Sub-Section on December 12 at 6 p.m.; meeting of Knoxville Sub-Section on December 13, at 7:30 p.m.

TEXAS SECTION—Luncheon meeting of the Dallas Branch at the Adolphus Hotel on January 1, at 12:15 p.m.; luncheon meeting at the Blackstone Hotel on December 11, at 12:15 p.m.

Tri-City Section—Dinner meeting at the Mississippi Hotel on December 14, at 6:30 p.m.

Virginia Section—Joint dinner meeting with Student Chapters at the Patrick Henry Hotel, Roanoke, on December 9, at 6 p.m.

West Virginia Section—Dinner meeting at the Governor Cabell Hotel, Huntington, on December 1, at 6:30 p.m.

Recent Activities

Cincinnati Section

The speaker of the evening at the October meeting of the Cincinnati Section was Charles T. Kennedy, designing engineer for the Ferro Concrete Construction Company. Mr. Kennedy supplemented his paper, which dealt with new developments in frostproofing concrete, with an exhibit of specimens and demonstrations. He also displayed some brochures showing that better concrete may be obtained by substituting natural cement for part of the portland cement.

Cleveland Section

"Cleveland's Place in Postwar Aviation" was the subject of discussion at the October meeting of the Cleveland Section, the speaker being Maj. John Berry. Although the Cleveland Airport handled 38,000 landings in 1943, a great increase over the 1940 total, Major Berry estimates that this figure is only one-twentieth of what may be expected after the war. He pointed out that it now takes a passenger longer to get from the east side of Cleveland to the airport than to get to Detroit, which is a 39-minute flight. Thus, Major Berry stated, it behooves the city to build a superhighway from downtown Cleveland to the airport, which would enable travelers to reach the airport in twelve minutes. This would be a worthy postwar project, he indicated.

District of Columbia Section

Much of the October meeting of the Section was devoted to a discussion of the Society's "Classification and Compensation Plan," adopted by the Board of Direction on July 18, 1944. The principal talk on the subject was given by Allen P. Richmond, Jr., assistant to the Secretary of the Society, who described the background of the work leading to the formulation and adoption of the plan and the practical applications that have been made of it, citing as examples the state of Arizona and the city of Milwaukee. Following an enthusiastic discussion of this subject, motion pictures of D-Day and of action at Cherbourg were shown.

Illinois Section

Joint luncheon meetings of the Section and the Chicago Engineers Club were held in both October and November. At the first of these Russell B. James, vice-president of the Burlington Transportation Company, spoke on "The Relation of Surface Carriers to Air Transport." According to Mr. James, practically all railroads agree that surface carriers should be permitted to engage in air transport, as an auxiliary to their other services, although some trucking lines do not hold to this position. The speaker at the November 9th meeting was A. J. Boase, manager of the Structural Bureau of the Portland Cement Association. In his talk, which concerned the subject of reinforced concrete construction in South America, Mr. Boase pointed out that such construction is much more daringly conceived and executed in South America than it is in the United States. Higher stresses, both for concrete and reinforcing steel, are used, but in conjunction with this the designers make very complete analyses.

Ithaca Section

On October 18 the Ithaca Section held its annual meeting and elected the following new officers for the ensuing year: John E. Perry, president; George D. Westra, first vice-president; L. L. Huttleston, second vice-president; and Howard M. Gifft, secretary-treasurer. The speaker of the evening was Dexter S. Kimball, dean emeritus of the Cornell University engineering school, whose subject was "Old San Francisco."

Los Angeles Section

The annual joint meeting of the Los Angeles Section and the Structural Engineers Association of Southern California took place on October 11. Following the usual dinner and introduction of guests, Frank J. Connolly presented an address on the subject of cooperation between engineers and architects. Mr. Connolly is manager of the Southern California Chapter of the Associated General Contractors of America.

Maryland Section

Recent advances in hydraulics were discussed at the October 26th meeting of the Maryland Section, the principal speaker being Boris A. Bakhmeteff, professor of civil engineering at Columbia University. Professor Bakhmeteff, who is chairman of the Executive Committee of the Hydraulics Division, spoke mainly on turbulence—its origin, the damage that may result from it, and methods of combating it. He explained that there is an improved type of current meter, capable of measuring accurately very small changes in the rate of flow. Following his talk, E. W. Lane and H. A. Thomas spoke briefly on the design of spillways and aprons of some of the larger dams recently built.

Metropolitan Section

The Metropolitan Section held its first meeting of the season on October 18. The feature of the occasion was a talk on the subject, "Domestic and World-Wide Problems of Oil," given by Robert E. Wilson, president of the Pan-American Petroleum and Transport Company. Dr. Wilson, who is chief consultant of the Petroleum Unit of the Office of Production Management, expressed an optimistic estimate of oil supplies if development of low-grade fields is encouraged. During the course of the evening S. E. Pardo, president of the Venezuela National Engineering Society, extended the greetings of his organization to the American Society of Civil Engineers.

On October 25 members of the Junior Branch of the Metropolitan Section heard Verne Ketchum describe the design and erection of hangars and depots constructed of laminated timber members. Mr. Ketchum is chief engineer of Timber Structures, Inc. The showing of motion pictures of lighter-than-air hangars and bomber hangars concluded the program.

Nebraska Section

Members of the Nebraska Section held a dinner meeting in Omaha on September 12. The after-dinner speaker was Leo M. Christensen, director of the Chemurgic Research Project in Nebraska, who described the engineering aspects of the Omaha Industrial Alcohol plant and its importance in the chemurgic program. Dr. Christensen pointed out that, in spite of wartime handicaps on labor and equipment, farm production in the nation is up 23% on less land than was cultivated in peacetime. The problem of what to do to maintain such increased productive power in the postwar period and, at the same time, make the best use of the products is chemurgy's chief concern. The chemurgic industries will take various farm products, many of which are now threatening to become surplus, and process them into such basic materials as cellulose, vegetable oils, and alcohol.

New Mexico Section

"Airlines Operation" was the subject of discussion at the September meeting of the Section, which was held at the University of New Mexico on the 14th. This was given by Freeman Fish, New Mexico district manager for Continental Air Lines. A thirty-minute sound film, furnished by the Continental Air Lines, was then presented by Charles Collier to supplement Mr. Fish's talk. Later the group adjourned to the engineering laboratory, where the Student Chapter acted as host and provided refreshments. The technical program at the October meeting consisted of a talk on some of the engineering accomplishments of the U.S. Bureau of Reclamation—given by Wesley R. Nelson, director for the Bureau's District 5.

Northwestern Section

A talk on sanitary engineering in the postwar period was the feature of the technical program presented at the October meeting of the Northwestern Section. This was given by George J. Schroepfer, chief engineer of the Minneapolis-St. Paul Sanitary District, who discussed the need for water purification and sewage-treatment plants, postwar planning in the water-works and sewerage field, and local problems and trends of interest to engineers. His talk was illustrated with lantern slides. At the meeting held on November 6 Bernard Blum spoke on recent railroad improvements. Mr. Blum is chief engineer of the Northern Pacific Railroad. He was followed by two other members of the staff of the Northern Pacific—E. W. Erwin and F. L. Steinbright—who discussed phases of railroad transportation and communication, respectively.

OREGON SECTION

Guest of honor and principal speaker at the September meeting of the Oregon Section was Nathan A. Bowers, Pacific Coast editor of *Engineering News Record*, who gave an illustrated talk on the performance of the construction industry in wartime activities in the Pacific. Many close-up pictures of the Seabees building advance base facilities supplemented his talk. Part of the meeting was devoted to business discussion.

PHILADELPHIA SECTION

A symposium on postwar planning and construction was the feature of the October meeting of the Philadelphia Section. The first speaker was Julius Adler, who reviewed the formation of the Society's and the Section's committees on postwar planning. He was followed by Hal H. Hale, executive secretary of the American Association of State Highway Officials and former Washington representative of the Society, who gave a brief history of the Association of State Highway Officials and mentioned some of its activities. The last scheduled speaker was Harold Hoffman, secretary of the Philadelphia chapter of the Associated General Contractors of America, whose subject was "Postwar Industrial Planning."

PITTSBURGH SECTION

The Section and the Engineers' Society of Western Pennsylvania held a joint meeting on October 20, which was addressed by Cyrus W. Rice. Mr. Rice, who heads a local company bearing his name, spoke on the need for better domestic and industrial waters in western Pennsylvania and eastern Ohio.

ROCHESTER SECTION

The technical program at the October 19th meeting of the Rochester Section consisted of a talk on air-entraining cements, given by R. R. Sheridan. Mr. Sheridan is in the structural engineering department of the Eastman Kodak Company, and a Junior member of the Section. During the business session it was decided to dispense with the 1944 award of Junior membership in the Society.

SACRAMENTO SECTION

The annual Junior Day, held on October 3, witnessed a historic debate on the question, "Resolved, that the State Water Project Authority Should Take Over the Central Valley Project." The disputants were all Juniors, with Merle Fischer and Warren Samarzich on the affirmative side, and Walter V. Gallagher and Glenn Laurgaard on the negative. The annual Ladies' Day luncheon and bridge took place a week later. On this occasion wives and mothers of members in the service were guests of the Section.

SAN FRANCISCO SECTION

A joint assembly of the construction groups of the San Francisco Bay area, sponsored by the San Francisco Section and the Structural Engineers' Association of Northern California, took place on September 20. Following dinner, a large group heard Nathan A. Bowers present the subject, "Construction Engineers on Pacific Battle Fronts." The list of guests included Admiral C. H. Cotter, director of the Pacific Division of the U.S. Bureau of Yards and Docks. The Section's regular bi-monthly meeting was held on October 17. The technical program for the occasion, which had been arranged by the Section's Sanitary Committee, consisted of addresses by Charles E. Smith, president of the California State Board of Health, and Walter H. Brown, acting dean of the School of Public Health, University of California.

The topic for discussion at the September 28th meeting of the Junior Forum was "Will Structural Welding Gradually Replace Riveting in the Field of Engineering Construction?" A talk on water purification—given by Michael H. Keyak, of the San Francisco Water Department—comprised the technical program.

ST. LOUIS SECTION

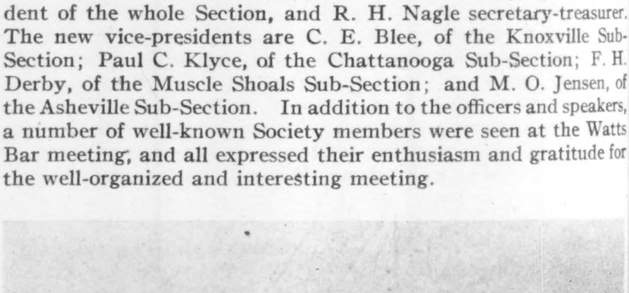
The guest of honor and speaker at the September 25th luncheon meeting of the St. Louis Section was E. C. L. Wagner, manager of the Associated General Contractors of Missouri. Mr. Wagner gave a general picture of the work done by the "Constitutional Convention" as it affects engineers. Some of the problems considered were the manner of raising funds for city and county improvements; the possibility of a Department of Revenue to replace seven tax-collecting agencies now existing; changes in the State Highway Department as it affects construction, maintenance, and financing; and permission for the state to construct and maintain airports.

TENNESSEE VALLEY SECTION

On November 4, about 175 members and guests of the Tennessee Valley Section met at the Watts Bar Dam on the Tennessee River near Spring City for an all-day session. Visitors, arriving in midmorning from many points in the valley, registered, were given a brochure describing the project, and then departed in groups for a two-hour inspection of the Watts Bar Steam Plant. All parts of this modern coal plant were in operation, including the new coal-unloading dock. At noon the parties returned to the cafeteria building, where the large dining room had been reopened for the occasion. President Harry Wiersema welcomed the visitors and expressed the Section's appreciation for the excellent arrangements made by Lloyd W. Donnelly, project manager, and his staff. Then Col. A. C. Polk, nominee for Vice-President of the Society from Zone II, addressed the group on the subject of postwar planning.

"Features of the Watts Bar Project" were ably discussed by Mr. Donnelly during the afternoon program. Other activities of the afternoon session included a review of committee activities and the election of officers for 1945. T. D. Lebby will be president of the whole Section, and R. H. Nagle secretary-treasurer. The new vice-presidents are C. E. Blee, of the Knoxville Sub-Section; Paul C. Klyce, of the Chattanooga Sub-Section; F. H. Derby, of the Muscle Shoals Sub-Section; and M. O. Jensen, of the Asheville Sub-Section. In addition to the officers and speakers, a number of well-known Society members were seen at the Watts Bar meeting, and all expressed their enthusiasm and gratitude for the well-organized and interesting meeting.

AN OFFICIAL GROUP AT THE WATTS BAR MEETING OF THE TENNESSEE VALLEY SECTION



GROUP OF MEMBERS AND GUESTS INSPECTS WATTS BAR DAM AT MEETING OF TENNESSEE VALLEY SECTION

Texas Section

Departing from past procedure, the fall meeting of the Texas Section was primarily devoted to business discussion, and no formal papers were presented. Members met in Austin on Thursday evening, October 12, for a buffet supper and good-fellowship hour. During the evening a motion picture, depicting the development of the water supply of southern California, was shown. The session on Friday morning, October 13, was called to order by President E. N. Noyes, who asked for reports of the several committees. Later in the morning George T. Seabury, Secretary of the Society, briefly outlined recent action of the Board of Direction on the subject of collective bargaining.

Toledo Section

On October 25 Henry D. Hale, the new manager of the Toledo Municipal Airport, addressed a dinner meeting of the Toledo Section on "The History and Future Progress of Aviation." Mr. Hale, who was recently discharged from the Navy Air Force, in which he held the rank of lieutenant commander, saw service from the Philippines to the Dutch East Indies and Australia as flight officer on an aircraft carrier. In addition to his prepared talk, he gave a short résumé of his experiences in the Pacific.

Tri-City Section

The Tri-City Section initiated the fall season with a dinner meeting in Moline, Ill., on October 25. A brief business session was followed by a talk on "Sewerage and Sewage Treatment." This was given by Kenneth V. Hill. Mr. Hill, who is connected with the Chicago engineering firm of Greeley and Hansen, discussed operating costs and methods of financing treatment works as well as problems of sewage collection and treatment.

Wisconsin Section

At the September 28th meeting of the Wisconsin Section sound moving pictures, entitled "Steel for the Armed Forces" and "Alloy Steels," were shown to the group and later discussed by Prof. J. E. Schoen, head of the mechanical engineering department at Marquette University. The films, which were produced by the Bethlehem Steel Company, showed the various methods and equipment employed in the manufacture of steel from the raw-material stage to the finished product.

Student Chapter Notes

Case School of Applied Science

The Case School of Applied Science Student Chapter made a field day of it on August 30, with an inspection trip to the Ravenna Ordnance Plant, about 45 miles from the campus. The afternoon was devoted to talks by representatives of the War Department and of Wilbur Watson and Associates, Architect-Engineers on this sixty-million-dollar loading plant. The talk given by S. Y. Symns, resident engineer on new work under way, covered the initial surveys and the building of the 100 miles of railroad, 50 miles of highway, 3,000 structures, drainage system, seven boiler plants and steam distribution systems, and the complex electrical and communications system. Prof. G. E. Barnes, Faculty Adviser for the Chapter, who was consulting engineer on all water supply and sewerage on the project, described those features. Inspection of parts of the project followed.

Case School of Applied Science Chapter Visits the Ravenna Ordnance Plant

Supper was held in the employees' dining room in the administration area, in company with a contingent of gracious young ladies, all employees of the War Department and of the Atlas Powder Company. The group then spent the evening in the recreation center, playing ping-pong, pool, and billiards, and dancing. As will be noted from the picture, the majority of the boys are in uniform. All are taking the full course in civil engineering, leading to the bachelor's degree.

University of Colorado

The annual dinner of the Chapter to celebrate the Milo S. Ketchum Award was held on the evening of October 7. It was a gala event. Over a hundred sat down to an excellent meal, served at Blanchard Lodge, some four miles up Boulder Creek. The occasion was notable for the presence of many national officers of the Society, including the President, Secretary, and Directors, as well as other guests. After dinner, E. M. Hoopes introduced R. G. Gustavson, president of the Chapter, who in turn presented Professor Raeder to introduce the speakers. The latter included President Pirnie; Secretary Seabury; Vice-President Thomas; Directors Rawn, Tipton, and Breed; Dean Crawford, of the University of Michigan; S. O. Harper, chief engineer of the U.S. Bureau of Reclamation; Dean Eckel; and Capt. F. H. Roberts, U.S. Navy, head of the University's Naval Unit.

Dinner for Milo S. Ketchum Award—Head Table and One Corner of the Dining Room

The main address was by Past-President Herbert S. Crocker, Hon. M. Am. Soc. C.E. who gave a glowing appreciation of the late Milo S. Ketchum, Hon. M. Am. Soc. C.E., his former partner and life-long friend. This led to the ceremony of presenting the award to Ewalt P. Anderson (University of Colorado, 1944), of the Naval Unit. The prize consisted of Junior membership in the Society—in Mr. Anderson's case, to be placed to his credit until such time as he shall begin paying dues as a civilian.

Georgia School of Technology

On October 14 the Georgia School of Technology Chapter sponsored an enjoyable dinner dance in honor of the new members. During the evening James C. Prather, president of the Georgia Section of the Society, awarded a prize to new member W. R. Martin for the best essay on an engineering job of some note, his paper dealing with the Fort Peck Dam. Each new member is required to submit such an essay. The honor guest of the occasion was Blake R. Van Leer, new president of the Georgia School of Technology.

During the past two months the Chapter, under the direction of Faculty Adviser R. P. Black (who, with F. C. Snow, founded the organization in 1923) has started a library in memory of the late W. A. Hansell, M. Am. Soc. C.E. Already there are over a thousand technical volumes in the library—all of them gifts, and all of them containing a memorial bookplate stating the name of the donor. Contributions for the purchase of new books already exceed $300. Beautiful furnishings have been provided by Mr. Hansell's family, and the place has become a highly popular retreat.

ITEMS OF INTEREST

About Engineers and Engineering

The World's Worst Engineers

By J. CHARLES RATHBUN, M. AM. SOC. C.E.

PROFESSOR OF CIVIL ENGINEERING, COLLEGE OF THE CITY OF NEW YORK, NEW YORK, N.Y.

ALL THE DANCING GIRLS LOOK ALIKE

A TRAVELER going overland from Saigon to Bangkok will pass close enough to the ruins of the ancient city of Ankor (in French Indo-China) to make it well worth his while to stop a few days and examine them. Be he artist, engineer, or historian he will find very interesting material for study. There is (or was before the war) a hotel described in the guide books as "good"—meaning pretty bad—within a couple of miles of the ruins, where the traveler will be induced to hire an elephant to make the tour. Later he will find walking, bicycling, or motoring to be more comfortable and cheaper.

The ruins at Ankor were discovered in 1861 and bought by the French Government from the Siamese. Perhaps "discovered" is not the right word, since the Cambodians knew about them all the time. They also knew that they were closely guarded by ghosts, spirits, and wraiths as well as tigers, cobras, and wild elephants. In fact, Ankor was the best place to be from known to the Cambodians. Besides, there are secret vaults and rooms in these ruins full of jewels, so the legends say, and white men are so curious about secret chambers—and have so little fear of jewel-guarding spooks! So for many centuries Ankor was one of the world's best-kept secrets, and its treasuries are still unfound and unlooted.

The nation of which Ankor was the principal city, was probably founded by a group of people who migrated there before the fifth century A.D. That they came from India can easily be figured out from the stories told by the temple carvings. Hindu ideas are everywhere evident. These people settled in the Mekong Valley and soon found it easy to conquer and enslave their peaceful neighbors, thus gaining control of all this section of the world. At one time it is estimated that the nation had a population more than half that of prewar France.

In the thirteenth century the entire city and country were abandoned to the jungle; the master race and the slaves disappeared—"sunk without a trace." The most plausible explanation of this mystery is that the percentage of slaves became too high; they revolted and sent their masters to "other worlds to conquer." Then, being but uncultured slaves, they preferred rice to carvings and moved south toward the rice paddies of Pnom Penh, leaving the great temples and palaces to the gods to whom they had been dedicated. Apparently being a master race was not an unmixed blessing even in those days.

A CORBELLED DOORWAY SURMOUNTED BY A HUGE HUMAN FACE

They left at Ankor many ruins of buildings that must have been at that time very imposing, but the jungle has since so surrounded them that a general view is hard to get. Ankor Wat, although not the largest of these buildings, is the best preserved and the freest from jungle growth. An examination of it will give an idea of the others.

At the time of its erection in the twelfth century, there was no larger building in the world outside of the city of Ankor. Ankor Wat covers a ground area of about 800 by 675 ft, and its highest point is some 215 ft above the base. Surrounding this building was a moat some 300 yd wide—a small lake in itself. Yet there is not a room in the entire building large enough to be of use.

The building is of stone, all the exposed faces of which are carved. There are literally miles of bas reliefs depicting punitive expeditions, hunts, elephants, dancing girls, and other representations of matters of public interest. There is a remarkable sameness about the designs. The elephants are all alike; the hunters look alike. Even the dancing girls all have the same facial expression, the same build. Only the pose varies. One might conclude from these observations that one and only one model was used, and that the artist had no imagination.

Today, during the tourist season, a troup of native dancers will perform near the temple, and the tourist will recognize the same costumes, the same stilted poses, and the same faces that have been staring from the temple walls for the past eight hundred years. Perhaps the sameness of design was deliberate, and perhaps it was due to slave labor. Thousands of carved figures can be seen carefully executed in every detail. Some are small but others are huge. The human faces on one building are large enough to dominate each of the entire walls of a tower over one hundred feet high.

As for the builders of the City of Ankor, they may have been artists, theologians, national planners, or warriors, but it is certain that they have no rivals to the

WHERE THE JUNGLE HAS CLAIMED THE WORK OF MAN title of the world's worst structural designing engineers. A superficial examination of Ankor Wat will bring out the reason for according them this doubtful honor. The other buildings are just as bad.

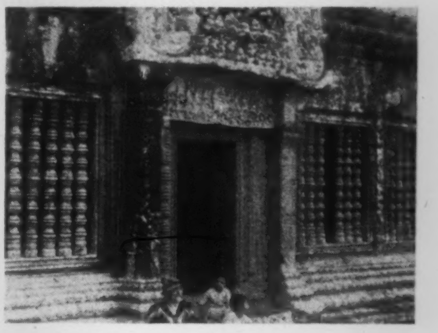
The theory of the arch and of the beam were unknown and the builders did not risk experimenting with models, or even attempt to build these elementary units except on door or window frames where no load is carried. The size of an opening or of a room was limited by the ability to corbel out the walls until they came close enough together so that a keystone could be laid across the opening. Structurally this keystone was a liability instead of an asset. Where this construction was used, the courses of the stone were laid horizontally, showing that the builders had no idea of arch action or of horizontal thrust.

In walls, the idea of breaking joints and bonding was not used. This resulted in failures where the walls had a sharp change in direction. Settlement due to faulty foundations has disclosed many places where a wall has not acted as a well-keyed unit. No cement of any kind was used in these huge buildings. And, as would be expected, although the foundations were on yielding ground, the loads were not proportioned to insure uniform settlement.

In designing, no thought was given to the nature of the material used. The designers based their work on timber construction. This is shown in the design of the framing for windows and doors. Even turned spindles—carved out of stone—were used as a grill. The builders sensed that stone does not carry tension safely when used as a beam, so in at least one case a stone beam was carefully hollowed out and an ironwood timber inserted to carry the load. And all this was done six hundred years after the great dome of St. Sophia was erected.

ANKOR WAT SHOWS INDIAN INFLUENCE

But in details the construction was most excellently executed. The joints were so close fitting that it was difficult for roots and seeds to get a start. The surfaces of the stones were polished before they were placed in contact. The stones came from a quarry about twenty miles away and were probably transported by water, since all the surrounding country was inundated during the rainy season. Some of these stones weighed over six tons, but the lever and the inclined plane were both known to the builders.



TURNED SPINDLES, CARVED OUT OF STONE, SHOW THE INFLUENCE OF WOOD CONSTRUCTION

Since the abandonment of Ankor engineering practice has advanced considerably, but we still have "master races" bent on enslaving all peoples within their "sphere of influence."

N. G. Neare's Column

Conducted by

R. ROBINSON ROWE, M. AM. SOC. C.E.

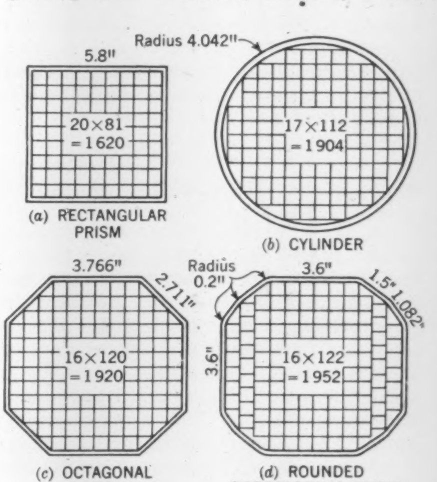
USUALLY it takes a gavel to hush the Engineers Club. At the December meeting a pipe did it. That was because the pipe reeked. From an offensive cloud of smoke the Professor emerged to explain, without apology, "Out of cigarettes, and I blame it on the specifications for overseas Xmas boxes. People filled them with cigarettes because any other GI craving ran the weight over 5 lb. Titus Wadhouse's box of cube sugar weighed over 16 lb—and that was our problem. How many 0.6-in. cubes did he pack in his box?"

"According to max-min calculus," said Joe Kerr, "the inside of the box would be a square prism 5.67 × 5.67 × 11.33, but those unyielding cubes force us to 5.4 × 5.4 × 12, for 1,620 cubes in 20 layers of 81 each."

"I'd send them in a keg," said Ken Bridgewater. "I figured the maximum circular section corresponding to various numbers of layers and found that I could fit 1,904 sugar cubes in 17 layers of 112 each. Joe, like John Q. Public, overlooked the efficiency of a cylinder when girth must be minimized."

"Still I can do better with an octagonal prism," countered Cal Klater. "I've sketched (Fig. 1*c*) an arrangement that would package 1,920 in 16 layers of 120 each, such that combined length and girth is 35.908 in. Like Joe, I deplore the departure from max-min mathematics; I'd hate to tell you how many layouts I 'cut and tried'."

"As a matter of fact," replied the Professor, "Titus used a keg, because it was easier to make. So I'm going to accept two solutions—the cylinder and the octagonal prism. However, the story would not be complete without showing Titus's design of a rounded dodecagonal prism (Fig. 1*d*) containing 1,952 lumps of sugar. Rounding all corners makes the girth of the box exceed the girth of the cubes by a complete circumference of 0.2-in. radius. Combined length and girth are 35.966 in. But Titus was too lazy to make it.



(*a*) RECTANGULAR PRISM

(*b*) CYLINDER

(*c*) OCTAGONAL PRISM

(*d*) ROUNDED DODECAGONAL PRISM

FIG. 1. SUGAR-BOX SECTIONS

"Our old friend Professor Othernut has another nut for us to crack—something about swimming pools for postwar projects isn't it, Ann?"

"That's right, Noah. Down in Prissyville, the town bought a triangular lot for a public pool, but the SPMB insisted that there be two pools, one for each sex, with a tight board fence between. The selectmen indicated the fence on the lot plot as a straight line from one vertex to the opposite side, to be laid out by Al E. Dayde, the town surveyor, so that equal circular pools could be inscribed in the lot on each side of the fence. How could Al do this with transit and tape, but without computations whatever?"

[*Cal Klaters were Richard Jenney and Capt. Paul L. Reed; Prof. John C. Prior and Lt. Dean Peterson preferred the acceptable cylinders. Guest Professor Ann Othernut is known to many as Prof. J. Charles Rathbun; he credits Lynne Bevan with the plot to the problem and Bevan père thinks he heard it from Bevan fils. Good plots move fast.*]

University of Illinois Bulletins Available

FIVE new bulletins have been issued by the University of Illinois Engineering Experiment Station and are now available upon application to the University of Illinois, Urbana, Ill. Researches for three of these bulletins—"Second Progress Report of the Investigation of Shelly Spots in Railroad Rails"; "Second Progress Report of the Investigation of Fatigue Failures in Rail Joint Bars"; and "Tenth Progress Report of the Joint Investigation of Fissures in Railroad Rails"—were conducted by the Engineering Experiment Station in cooperation with the Association of American Railroads. All three bulletins sell for 15 cents.

The other two bulletins are entitled "Principles of Heat Treating Steel" and "Fatigue Strength of Fillet-Weld and Plug-Weld Connections in Steel Structural Members." The first of these, written by Harold L. Walker and reprinted from *Ceramic Industry*, is 15 cents. The other costs $1. It was written by Wilbur M. Wilson, Walter H. Bruckner, John E. Duberg, and Howard C. Beede, and reports an investigation of the Engineering Experiment Station in cooperation with several other organizations.

Highway Research Board Announces New Publications

RECENTLY published books and pamphlets have been offered to the profession by the Highway Research Board. These include Volume 23, Proceedings of the Board, Roadside Development Reports, and a series of bulletins on important highway topics of the times.

The bulletin treats the following topics:

No. 1. Curing Concrete Pavements Under Wartime Restrictions on Critical Materials.

No. 2. Design of Highway Guards.

No. 3. Design of Concrete Pavements Requiring a Minimum of Steel.

No. 4. Maintenance Methods for Preventing and Correcting the Pumping Action of Concrete Pavement Slabs.

No. 5. Granular Stabilized Roads.

No. 6. Patching Concrete Pavements with Concrete.

No. 7. Use of Soil-Cement Mixtures for Base Courses.

No. 8. Thickness of Flexible Pavements for Highway Loads.

To secure bulletins or for further information address the Highway Research Board, 2101 Constitution Avenue, Washington 25, D.C. Prices range from 10 to 25 cents, with substantial reductions on orders of 100 or more copies.

Address—U.S.A.

THE SOCIETY'S mailing department recently noticed an incoming air mail letter addressed simply to

The Secretary
The American Society of Civil Engineers
U.S.A.

It had come straight from Egypt to the Headquarters of the Society in New York.

Naval Intelligence Seeks Information on Far East

REAR ADMIRAL William R. Munroe, USN, Commandant, Third Naval District, has announced that the New York office of the Navy Intelligence Service is prepared to accept as gifts or loans, pictures and maps of areas now under enemy control in the Orient. Members of the Society possessing photographs or maps concerning Jap-controlled areas in the Pacific are requested to communicate with the District Intelligence Officer, 90 Church Street, New York City, if they are located in the States of New York, Connecticut, or the northern half of New Jersey. Those located elsewhere will aid the Navy by communicating with the nearest office of the U.S. Navy, Naval Intelligence Service. Other U.S. Navy District Intelligence Offices are located in Boston, Philadelphia, Norfolk, Charleston, Miami, New Orleans, Chicago, San Diego, San Francisco, Seattle, Annapolis, and Washington, D.C.

The specific areas of interest are the Japanese mainland, mandated and other islands, including Korea, Formosa, and the Kuriles; Manchuria, the Philippines, occupied China, the Netherlands East Indies, Indo-China, Thailand, Malaya, and Burma.

In addition, the Navy wishes to interview persons with first-hand knowledge of the above-mentioned areas, Rear Admiral Munroe said.

Glossary of Foreign Welding Terms

A GLOSSARY of foreign welding terms published by the American Welding Society is now available to supplement standard or engineering dictionaries. Contractors, students, and others who may have occasion to consult welding drawings or specifications using German, French, Russian, or Spanish terms will find the glossary valuable.

Many of the terms for which English definitions or equivalents are given have been derived from foreign technical literature and are not found in any standard or technical dictionaries. The glossary is published as a paper-covered pamphlet of 16 pages. The price is 50 cents, and it can be purchased from the American Welding Society, 33 West 39th Street, New York, 18, N.Y.

Society Badge Stays On

IN SPITE of the provision of safety catches on Society badges, frequent losses are still reported. One of our members has successfully solved this difficulty by a simple expedient. He has had a 1-in. length of fine jeweler's chain soldered to the back of his badge near the top. A small safety pin from in back attaches this chain to his vest or shirt as the case may be. Then the badge itself, when attached, covers the chain. This arrangement has worked successfully for 25 years or more with him.

Learn Spanish and Be a Good Neighbor

IN furtherance of the movement to bring the Americas closer together through an exchange of language knowledge, the Pan American Society (Sociedad Panamericana of Quito, Ecuador) has prepared a free pamphlet which gives simple rules for the understanding of a large number of Spanish words.

The Division of Inter-American Relations reports that hundreds of Pan American Clubs have been formed in United States junior and senior high schools as well as in colleges. The adult public, however, has not been afforded such opportunities for learning Spanish. Throughout South America, hemispheric-minded newspapers and magazines are carrying regular lessons in English.

Although it is not generally known, more than three hundred Spanish and English words are spelled exactly the same. Also, by simple rules, the endings of thousands of other English words can be changed so as to convert them automatically to Spanish words of similar meaning. It is possible, then, for the average North American to acquire a rather extensive smattering of the Spanish language with a minimum of study and effort, by learning which English and Spanish words are identical in spelling, and which English words can be converted to Spanish by the simple expedient of changing their endings.

The pamphlet on "Simplified Spanish," which describes the words and endings referred to, is available without any charge or obligation to all who wish to send for it. It was prepared by Señor Don Arturo Montesinos M., Professor of English at Ecuador's "West Point," especially for free distribution in North America by the Pan American Society.

Those desiring the pamphlet should send their names and addresses to the Pan American Society, Box 315, Quito, Ecuador, South America. Stamp collectors will appreciate the postage stamps which will be affixed to the wrappers. Applicants should be patient in waiting for their copies, since the ship mails between the Americas are somewhat irregular these days.

Toward Fewer Industrial Accidents

BECAUSE American industry has exhausted just about every source of manpower except the reserve now wasted by industrial accidents, engineers may be interested in the pamphlet, *Safety Through Management Leadership*. Aimed primarily at the smaller war plants, which can rarely employ trained safety engineers, this pamphlet cites the actual experience of plants of varying sizes in organizing for safety.

The message is directed to management, and asks for the drive and leadership that management can supply. Copies may be secured so long as the free supply lasts from the Division of Labor Standards, U.S. Department of Labor, Washington 25, D.C.

NEWS OF ENGINEERS

Personal Items About Society Members

Frank Ragaini and **James C. Brown** have established a consulting and contracting engineering practice under the name of Clarence Blair Associates, Inc., at 100 Crown Street, New Haven, Conn. Until recently Mr. Ragaini was assistant treasurer of Clarence M. Blair, Inc., the former firm operated by the late Clarence M. Blair.

William F. M. Longwell is now on the civil engineering staff of Worcester Polytechnic Institute at Worcester, Mass. In 1941 Mr. Longwell retired from the Corps of Engineers, U.S. Army, with the rank of major.

Francis T. Crowe has been selected for the non-member award of The Moles, New York organization of tunnel and heavy construction men, "for outstanding contributions to construction progress." He began his career with the U.S. Bureau of Reclamation, for which he worked on a number of dams, and as general superintendent for the Six Companies, Inc., he completed Boulder Dam in five years, over two years ahead of schedule. Then came Parker and Shasta dams. In 1944 Mr. Crowe was made an Honorary Member of the Society. Presentation of The Moles' award to him will be made at a dinner meeting of the organization, to be held in New York on February 7.

Francis T. Crowe

Julian L. Schley, major general, U.S. Army, has been made head of the newly created department of transportation in the Office of Inter-American Affairs and assistant coordinator of the Office. General Schley was formerly director of the division of transportation, now replaced by the department of transportation.

Leonard N. White, who recently retired from active duty as a major in the Corps of Engineers, U.S. Army, has been named engineer for the Pulaski County (Arkansas) Planning Board. Since his retirement from military service Mr. White has been in engineering practice in Little Rock.

Percy Michener has been promoted from the rank of lieutenant colonel in the Corps of Engineers, U.S. Army, to that of colonel. He has left Camp Gordon Johnston, where he was recently stationed, for a port of embarkation.

Quan Yuen Ching is now a captain in the Corps of Engineers, U.S. Army, the rank representing a promotion from that of first lieutenant. He is stationed in China, where he is on duty with the Burma Road engineers.

C. S. Seabrook, until lately civil engineer in the U.S. Engineer Office at Fort Lewis, Wash., has been appointed planning engineer for the public works department at Tacoma, Wash.

S. C. Hollister, dean of the college of engineering at Cornell University, has been appointed by Governor Dewey to serve on an advisory committee to the New York State Department of Commerce. The committee is to advise on the technical and industrial development in the state.

Irvin R. Wanke was recently promoted from the rank of captain in the U.S. Army to that of major. Major Wanke is stationed with the China-Burma-India Services of Supply, with headquarters in New Delhi, India.

Yves Nubar, formerly engineer for the U.S. Treasury, has been appointed director of research and development for Hub Industries, Inc.

H. T. Person was elected president of the National Council of State Boards of Engineering Examiners at the 24th annual convention of the organization, which was held at Lexington, Ky., on October 30 and 31. He is professor, and head of the department, of civil engineering at the University of Wyoming.

S. R. Young has been promoted to the position of assistant general manager of the Atlanta and West Point Railroad Company, the Western Railway of Alabama, and the Georgia Railroad, which he has served since 1932 as chief engineer.

Wallace R. Jones, Lieutenant, Corps of Engineers, U.S. Army, is now on a construction project in the Aleutian Islands.

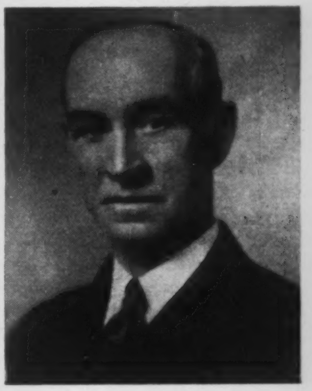
Waldo E. Smith, hydraulic engineer for the U.S. Public Roads Administration, in Washington, D.C., has been appointed to the newly created post of executive secretary of the American Geophysical Union.

Jesse K. Giesey, until lately division engineer for the Lake Erie Water Project, City of Toledo, has succeeded to the position of superintendent of operations for the Toledo Water Department.

Charles M. Allen, professor of hydraulic engineering at Worcester Polytechnic Institute, has been awarded honorary membership in the American Society of Mechanical Engineers. Presentation of the award will take place at the annual meeting of the society, which will be held in New York, November 27 to December 1.

Edward C. Fay, Jr., first lieutenant, U.S. Army, has been awarded the Bronze Star Medal "for meritorious service in connection with military operations against the enemy . . . from March 29, 1944, to June 26, 1944, in England and in France. . . ." Connected with the Provisional Engineer Special Brigade Group, "Lieutenant Fay was charged with the preparation of the important phases of intelligence planning for his unit's part in the continental assault. . . . His intelligence, sound judgment, and insight into tactical requirements enabled him to make an outstanding contribution to the success of the assault on the continent."

William V. McMenimen is the winner of the Moles member award for the coming year, in recognition of the executive and construction skill shown by him in developing naval air bases throughout the Pacific, as chairman of the executive board of eight contractors known as Pacific Naval Air Base Contractors. Since 1918, Mr. McMenimen has been vice-president and general manager of the Raymond Concrete Pile Company, supervising many difficult foundation jobs, including the piers for the San Francisco–Oakland Bay Bridge. Presentation of the award to him will be made at the same time as that to Francis T. Crowe, on February 7 in New York.


William V. McMenimen

Travis L. Smith III was recently promoted from the rank of captain in the Corps of Engineers, U.S. Army, to that of major. For the past nine months Major Smith has been in China, where he is district engineer on the construction of the Burma Road. His home is in Houston, Tex.

S. S. Gorman is the recipient of a Meritorious Civilian Service Award Emblem from the Navy. This award was given "in recognition of excellent services rendered over and beyond those normally required in connection with his duties in the construction program of the Bureau of Yards and Docks." Mr. Gorman has been acting as manager of contract negotiation for the U.S. Naval Drydocks at Hunter's Point, Calif.

E. B. Debler has been appointed director of the newly created Region 7 of the U.S. Bureau of Reclamation, with headquarters in Denver, Colo. The new region will include most of Nebraska, and parts of Colorado, Wyoming, Kansas, and South Dakota—territory formerly serviced by the southern part of Region 6 and the northern part of Region 5. Mr. Debler has been on the staff of the Bureau for the past twenty-six years—most recently as hydraulic engineer in charge of project planning.

Harold A. Stepleton, consulting sanitary engineer, of Toledo, Ohio, recently completed eighteen months of work with the engineering faculty at the University of Toledo, where he was in charge of the physics laboratory during the air cadet training period. Mr. Stepleton has returned to private practice and is now a member of the staff of Floyd G. Brown and Associates, of Marion, Ohio, consulting sanitary engineers on water supply, sewage, and industrial waste treatment.

DECEASED

Eric Edwin Blomgren (M. '41) district engineer for the Michigan State Highway Department at Kalamazoo, Mich., died at his home there on October 11, 1944. Mr. Blomgren, who was 55, had been with the State Highway Department since 1933 — first as maintenance engineer and for the past six years as district engineer for the counties of southwestern Michigan. Before his service with the highway department he was planning engineer for the Ford Motor Company in the Upper Peninsula; plant engineer for the Nash Motor Company in Milwaukee; and resident engineer for the Illinois State Highway Department.

Albert Marshall Brosius (M. '10) consulting engineer of New York, N.Y., died on October 9, 1944, at the age of 75. Early in his career Mr. Brosius had a consulting practice in Los Angeles, and later was senior engineer for the Emergency Fleet Corporation in Washington, D.C. He then established a civil and sanitary engineering practice in New York, which he maintained until 1935, becoming assistant engineer of design for the New York Department of Sanitation in the latter year. He remained with the Department of Sanitation until 1939 when he became connected with the Department of Public Works, and in 1940 he again established a consulting practice in New York.

John Edward Bussell (Jun. '41) Ensign, Civil Engineering Corps, U.S. Naval Reserve, was killed in the European theater of war on June 6, 1944. He was 24. Mr. Bussell graduated from the University of California in 1941, receiving the degree of B.S. in civil engineering. Before joining the Navy he was employed as a student engineer with the Panama Canal Commission. His home was at St. Joseph, Mo.

Albert Webster Galbreath (M. '26) retired civil engineer, died in Columbus, Ohio, on October 15, 1944. Mr. Galbreath, who was 55, served during the first World War with the 12th Engineers in France, having the rank of captain. He then became valuation engineer for the Missouri, Kansas and Texas Lines at Parsons, Kans., severing that connection in 1932 to establish a consulting practice in St. Louis. From 1937 until his retirement in 1942 he had a consulting practice in Columbus.

Donald Winthrop Howes (M. '26) of Newburgh, N.Y., died on October 15, 1944, at the age of 63. Early in his career Mr. Howes was with the New York Rapid Transit Commission and the New York Board of Water Supply. During the first World War he served as engineer for the Quartermaster Corps of the U.S. Army on the construction of Camp Upton. Later (1922 to 1934) he was with Fuller and McClintock whom he served in a variety of capacities—as resident engineer on the construction of the Richmond (Va.) and Kansas City filter plants and on sewage-treatment works for New Rochelle, N.Y., and Tenafly, N.J. He was, also, engineer in charge of construction of the Wanaque (N.J.) Aqueduct. More recently Mr. Howes had been division engineer at Newburgh for the New York City Board of Water Supply, retiring about a year ago.

Howard Chapin Ives (Assoc. M. '10) civil and consulting engineer of Laguna Beach, Calif., died in Waterbury, Conn., on October 6, 1944. Mr. Ives, who was 66, spent his early career in teaching—from 1903 to 1906 he was assistant professor of civil engineering at the University of Pennsylvania; from 1906 to 1912, assistant professor of railroad engineering at Worcester Polytechnic Institute; and from 1912 to 1925, professor of railroad engineering at the latter institution. Since 1925 he had maintained a consulting engineering practice. Mr. Ives was also the author of a number of engineering textbooks.

James Alexander McFadden (Assoc. M. '38) associate structural engineer for the Tennessee Valley Authority at Knoxville, Tenn., died on October 22, 1944. His age was 43. Born and educated in Canada, Mr. McFadden had spent his professional career in this country. He had been with Consoer, Older and Quinlan and the Commonwealth Edison Company, both of Chicago, and the U.S. Forest Service and National Park Service. He had been connected with the Tennessee Valley Authority since 1939.

Frederick Hosea Richardson (M. '41) lieutenant colonel, Corps of Engineers, U.S. Army, retired, died suddenly in Salt Lake City, Utah, on November 5, 1944. He was 61. From 1906 to 1917 Colonel Richardson was in general engineering work, and from 1918 to 1919 he served with the A.E.F. in France, having the rank of captain in the Corps of Engineers. Later he was district engineer for the Portland Cement Association in Utah. He was lieutenant colonel in the Corps of Engineers, Reserve, and was ordered to active duty in 1940. Before his recent retirement he was stationed at Fort Dix, N.J.; the Columbus (Ohio) Engineer Supply School; and the Richmond (Va.) Army Service Forces Supply Depot.

Allan Townshend Ricketts (M. '19) principal consulting engineer, Office of the Chief Engineer, Federal Works Agency, Washington, D.C., died at his home in Arlington, Va., on October 31, 1944. Mr. Ricketts, who was 61, was for a number of years (1915 to 1927) on the staff of Nicholas S. Hill, Jr., New York City consultant. More recently he was deputy chief engineer for the Public Works Engineering Corporation and its successor, the Trojan Engineering Corporation, in New York. Since 1932 he had been, successively, with the Reconstruction Finance Corporation, the Public Works Administration, and the Federal Works Agency.

Paul Dudley Sargent (M. '11) retired engineer of Medford, Mass., died recently at the age of 71. Mr. Sargent had been highway commissioner of Maine and chief engineer of the Maine State Highway Commission. More recently he was vice-president in charge of sales and manager for the New England Metal Culvert Company and general manager of the Corrugated Metal Pipe Manufacturers' Association of New England—first in Boston and, later, in Portland, Me. Mr. Sargent was United States delegate to the International Road Congress in Milan, Italy, by appointment of President Coolidge.

Robert Kenneth Schrader (Jun. '40) first lieutenant, Air Corps, U.S. Army, was declared dead on June 26, 1944, having been missing in action since June 25, 1943. Mr. Schrader, who was 24, was first pilot and flight commander, and held the Purple Heart decoration. He graduated from the University of Pittsburgh in 1940 and received the degree of M.C.E. from Cornell University the following year. Upon his graduation from the University of Pittsburgh, he was awarded the Pittsburgh Section's prize of Junior membership in the Society.

Frank Ellsworth Trask (M. '01) consulting engineer of Los Angeles, Calif., died on September 4, 1944, at the age of 81. Mr. Trask was chief engineer for the San Antonio Water Company, of Ontario, Calif., from 1890 to 1900, and consulting engineer for the same organization from 1901 to 1920. Simultaneously for parts of this period he served in a consulting capacity for the Arrowhead Reservoir and Power Company, the West Los Angeles Water Company, the San Gabriel River Association, and the Mojave Irrigation District. Later he served as California State Engineer for the PWA, and in 1934 and 1935 he was in Washington, D.C., as a member of the Technical Board of Review of the PWA.

Walter Frank Whittemore (M. '05) consulting engineer of Newton, N.J., died in a hospital there on October 27, 1944, as the result of injuries suffered in a fall. He was 86. Early in his career Mr. Whittemore taught civil engineering at New York University, and later was with the Hamburg-American Line in Hoboken, N.J. During the latter period he was, also, consultant for various neighboring towns. Long prominent in the New Jersey National Guard, Mr. Whittemore was a retired colonel of the Essex Troop.

Donald Witten (M. '24) senior bridge engineer, U.S. Public Roads Administration, Washington, D.C., died suddenly on October 4, 1944. Mr. Witten, who was 54, spent several years with the consulting engineering firm of Wood and Witten in Tulsa, Okla. Since 1938 he had been with the Public Roads Administration in Washington, where for several years he was in charge of the bridge division of the Administration in that district.

Civil Engineer or Professor of Civil ngineering; M. Am. Soc. C.E.; research engi- eer with 20 years' experience covering a wide nge; paving, water supply, sanitation, railroad onstruction, engineering materials, and struc- ural design. Each of considerable magnitude. pecailist on stresses or design; prefer South and est. $5,000. C-47.

Assistant Manager; Assoc. M. Am. Soc. C.E.; graduate engineer; 29 years' varied xperience, industrial and power plants; directed ayout, design, estimating, scheduling, and andled client and public relations on many proj- cts. Licensed professional engineer in three tates, and approved by National Council of ngineering Examiners. C-48.

Positions Available

Structural Steel Checker. Must have ell-rounded experience in structural steel de- gn. Man who has had crane and hoist experi- nce preferred. Should also have good knowledge f mechanics. Salary open. Location, New ersey. W-2733.

Civil Engineer, executive, not over 40, ex- erienced in pre-stress concrete design, such as ridging, building frame work, etc. Salary, bout $7,200 a year. Location, New York, N.Y. -2828.

Assistant Professor, structural designer with xperience in airplane industry for permanent eaching position. Salary, $3,600 for about 9 onths. Location, Ohio. W-2945.

Transitmen, Rodmen and Chainmen for rge construction project; 8 to 10 months' ork. Salary open. Location, southern New ersey. W-2957.

Instructors capable of teaching engineering echanics or civil engineering subjects to soldiers n the Army Specialized Training Program. Full- ime teaching positions. Salary commensurate ith qualifications. Location, Pennsylvania. -2973.

Assistant Structural Engineer, young, with xperience in structural design on industrial or ctory buildings, steel, reinforced concrete and asonry. Will be assistant to chief structural ngineer for firm of consulting engineers. Per- anent with opportunity. Salary, $3,900 a year. ocation, Connecticut. W-2992.

Assistant Professor of Surveying for rmy Specialized Training Program. Salary, 200-$250 a month. Apply by letter giving com- lete information. Location, Alabama. W-2995.

Instructors in civil, mechanical, or electrical ngineering. Salaries, $2,400–$3,600 a year ocation, New York State. W-3015.

Instructors. (*a*) Instructor able to teach lementary structural and topographical drafting nd perhaps some elementary structural design. *b*) Instructor able to teach surveying, both theory nd handling the field instruction and some ele- entary work in water supply and sewage dis- osal. Location, Virginia. W-3019.

Junior Architectural Engineer. Duties ill involve general architectural and structural ork, redesign, window displays, etc. Starting alary, about $3,000–$3,300 a year plus 20% vertime. Location, Ohio. W-3036.

Sanitary Engineer to assist in stream pollu- ion survey and later in a study of sewage treat- ent. Should also be qualified to perform chemi- al and bacteriological analyses of water and ewage and chemical analyses of industrial wastes. omen will be considered. Nine months' mployment with possibility of indefinite con- inuation. Salary, $175–$250 a month. Apply y letter giving complete information. Location, labama. W-3057.

Instructor, young, for department of civil nd architectural engineering. Should be gradu- te civil engineer with some experience or special tudy—preferably in hydraulics, structures or ircraft. Would teach mechanics, hydraulics, aterials testing, surveying, elementary theory f structures, elementary design, etc. Salary, bout $2,670 a year for 12 months. Location, olorado. W-3070.

Engineer with some technical training and/or xperience on structural steel or equipment in- tallation. Salary, to $3,640 a year for 54-hour eek. Location, South. W-3078.

Architectural Engineer or Civil Struc- ural Designer. Salary, $4,000 a year or more. ocation, Tennessee. W-3096 (*a*).

Civil Engineer with experience on hydraulic urvey, stream flow, flood control study, etc. alary, about $3,600 a year. Location, New York etropolitan area. W-3131.

MICROTOMIC
VAN DYKE
TWENTY INCH SLIDE RULE
The modern MICROTOMIC HI-DENSITY Lead
produces a more EFFECTIVE HI-DENSITY Line.
ROUND SHAPED LEADS
CHISEL SHAPED LEADS
EBERHARD FABER

HI-DENSITY

MICROTOMIC

VAN DYKE

DRAWING PENCIL

sponsors a

20" SLIDE RULE

Immediately Available—at next to no cost. A circular duplication of a full 20 inch Mannheim slide rule... Precision graduated, and printed on sturdy cardboard. Continuous reading due to circular design... as timely a boon to designers as the blue-printability of tracings made with a Hi-Density Van Dyke pencil!

★ IMMEDIATE DELIVERY without priority

25c POSTPAID

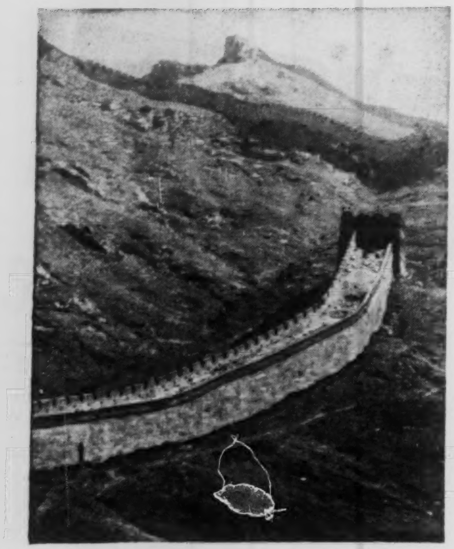
EBERHARD FABER PENCIL COMPANY
37 Greenpoint Ave., Brooklyn 22, N. Y.

Here is my 25¢ . . . please mail Slide Rule at once, to

Name ______________________

Street & No. ______________________

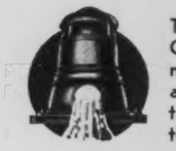
City & State ______________________



The Great Wall of China Built About 3000 B.C.

BUILT TO LAST

A LONG LONG TIME



The founders of the Layne Organization realized the tremendous importance of water as a health, safety and industrial necessity. They pledged themselves never to sacrifice quality in the manufacture of Layne Pumps and Well Water Systems. That pledge, to the ever grateful thanks of thousands of Layne Well Water System owners, has been faithfully kept.

Today as always, Layne Pumps and Well Water Systems are still being made of the very finest quality materials. They possess highly important and exclusive features of construction which measureably lengthen their long life. And in addition, they embody outstanding and thoroughly proven engineering ideas that guarantee highest efficiency.

Wherever modern well water producing equipment is used—whether in the United States or in foreign lands, that which bears the name of Layne is definitely recognized as the world's standard by which all other makes are judged.

If your postwar plans call for the use of more water, Layne engineers will gladly cooperate in providing sound recommendations. For literature address LAYNE & BOWLER, INC., General Offices, Memphis 8, Tenn.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

LAYNE

WELL WATER SYSTEMS

DEEP WELL PUMPS

Builders of Well Water Systems for every Municipal and Industrial Need

Current Periodical Literature

Abstracts of Magazine Articles on Civil Engineering Subjects

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file and may be borrowed from the Engineering Societies Library. Photoprints will be supplied at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage.

BRIDGES

CONCRETE, PORTUGUESE INDIA. Submersible Bridge in Portuguese India. *Concrete & Constr. Eng.*, vol. 38, no. 9, Sept. 1943, pp. 291–293. Bridge described was constructed so as to allow normal floods to pass during rainy season and to be submerged safely in times of exceptional rains; bridge spans middle portion of river 990 ft. wide; bridge is of five 32 spans of 328 ft., having rise/span ratio of 1/10; elevation and plan view are shown in drawings.

HIGHWAY, KENTUCKY. New Bridges on Dixie Highway. *Eng. News-Rec.*, vol. 131, no. 13, Sept. 23, 1943, pp. 469–471. Erection problems presented in construction of two road bridges on widened Dixie Highway between Louisville and Munfordville, Ky.; one crossing is 7-span plate-girder bridge over Salt River; other is 630-ft reinforced concrete slab and girder overpass spanning intersection of two railroads.

STEEL, WELDING. Swing Bridge Is Semi-Welded, B. W. Shimkin. *Welding J.*, vol. 22, no. 9, Sept. 1943, pp. 716–718. Details of application of arc welding on swing bridge built by California Division of Highways in 1942 across Mokelumne River; in course of design investigations, riveted, welded, and semi-welded types of through-truss highway bridges were studied; some of these matters are presented. James F. Lincoln Arc Welding Foundation award paper.

SUSPENSION, BRITISH COLUMBIA. Peace River Suspension Open, R. Archibald. *Western Construction News*, vol. 18, no. 8, Aug. 1943, pp. 349–350. Longest structure on Alaska Highway, with main span 930 ft and loaded backstay spans of 465 ft, built under winter conditions; erection tower mounted on ice skids.

SUSPENSION, WRECKING. Dismantling Tacoma Narrows Bridge Towers, C. E. Andrews. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 602–603. After cables had been taken down, heavy steel sections of towers themselves were dismantled in reverse order of assembly by "busting out" rivets of field joints and lifting down shop fabricated sections, weighing as much as 30 tons, with two Chicago booms placed so that they could move one another.

WOODEN. Sikanni Chief River Spanned, W. S. Powell. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 446–448. 584-ft timber-deck truss bridge on Alaska Highway 164 miles north of Dawson Creek, B. C., completed in 23 weeks while river was frozen over; truss quarter sections fabricated on river ice before being raised into place; timber pretreated.

BUILDINGS

CAMPS, MILITARY. Military Huts and Structures at American Installations in Britain, W. G. Bowman. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 608–615. British designs are used for all structures at American camps, depots, hospitals, and airfields in Great Britain; arched buildings of corrugated steel or cement asbestos are most used, but pre-cast concrete frame with hip roof and brick, tile, or concrete curtain walls is appearing more frequently; bolted flat-bottom steel tanks on steel towers, brick sewage plant structures, and steel rigid-frame hangars are standard.

HANGARS. Long-Span Arches for Modification Center. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 632–635. Airbase modification center required eight hangars arranged in two rows of four each and separated by shops, plus office building at each end parallel to hangars; for six of the hangars, 156-ft laminated timber arches with 10-ft centers were used and, for the other two, similar 177-ft arches were erected on equal spacing; all arches are supported on reinforced foundations and no ties are employed below floor.

HOSPITALS, COLD WEATHER CONSTRUCTION. Hospital Construction in Winter Weather. *Eng. News-Rec.*, vol. 131, no. 19, Nov. 4, 1943, pp. 693–695. Because of severe winter weather brick and tile walls of several hospital buildings were built inside temporary enclosures; wall and roof panels consisted of tarpaulins nailed over light frame, and their support required only very light framing along center of building; by adding salamanders inside enclosure and heating mortar, brick, and tile, 96 buildings were built in 3 months.

HOSPITALS, NAVAL. Navy Builds Large Hospitals. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 451–452. Semi-permanent hospitals under construction in California are largest buildings ever prefabricated; fire-resistant materials reduced amount of lumber used.

HOUSES, PREFABRICATED. Vanport, Oregon's Second City, D. L. Lynch. *Western Construction News*, vol. 18, no. 8, Aug. 1943, pp. 351–354. Mass production methods used to complete 9,942-unit frame housing project in 10 months; design features, drainage, water and sewer systems, electricity, roads and streets, landscaping, and recreational areas.

MODIFICATION CENTER. Air Center for Denver Area. *Western Construction News*, vol. 18, no. 8, Aug. 1943, pp. 362–364. Brief description of grading and paving operations and building construction, using latest methods and equipment, in building Colorado Modification Center.

CONCRETE

MIXING. Precision in Batching Concrete. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 21–22, 34. Development in science and equipment of concrete mixing; method of allowing for moisture in coarse and fine aggregates to fraction of 1%, without any calculation or delay, described.

RESERVOIRS. 2,000,000 Gallons Reinforced Concrete Reservoir and Water Tower. *Surveyor*, vol. 102, no. 2695, Sept. 17, 1943, pp. 387–388. Details of erection of reservoir of 1,000,000-gal capacity, together with water tower of same capacity 37 ft 6 in. above it; design of elevated tanks; reinforcement; concrete; floor and wall joints; access to high tank; tests for watertightness; cost.

ROOFS, DESIGN. Pre-Cast Concrete Pitched Roof Construction. *Surveyor*, vol. 102, no. 2684, July 2, 1943, pp. 273–275. Details of drawings of system developed in connection with program for housing agricultural workers in Great Britain; system uses no timber scantlings, is suitable for use with plain or interlocking tiles, or slates, and is designed to accommodate normal range of domestic spans.

DAMS

CONCRETE. New Dam Strengthens Maryland Water Supply, H. R. Hall. *Am. City*, vol. 58, no. 8, Aug. 1943, pp. 51–53. Washington suburban sanitary district is building dam in Patuxent River to meet added demand for water in suburban area; dam is 995 ft long; maximum depth of water at dam will be 63 ft; concrete section is of reinforced flat slab and buttress design, of Ambursen type; desilting arrangements; foundation; interconnections arranged; project will provide 20 mgd.

RESERVOIRS, LEAKAGE. Leakage Troubles in Emergency Reservoirs, W. L. Armstrong. *Surveyor*, vol. 102, no. 2689, Aug. 6, 1943, p. 329. Eight large emergency reservoirs have been built in Margate—four by contract and four by direct labor; leakages developed in some of structures, and notes describing steps taken to restore them to watertight condition.

FLOOD CONTROL

IOWA. How Council Bluffs Fought Off Flood. *Am. City*, vol. 58, no. 8, Aug. 1943, pp. 44–46. Protective measures taken at Council Bluffs, Iowa, to prevent Missouri River flood.

FLOW OF FLUIDS

PIPES. Flow in Silted Sewers, E. D. Grubb. *Surveyor*, vol. 102, no. 2687, July 23, 1943, pp. 307–308. Report of experiment conducted on two silted sewers of varying degrees of roughness; conclusion agrees with earlier experimental results which show that resistance varies according to different powers of velocity for different degrees of roughness; adjustment of roughness coefficient is shown.

FOUNDATIONS

CAISSONS, CONCRETE. Reinforced Concrete Caisson Substructure to Silo, L. E. Hunter. *Concrete & Constr. Eng.*, vol. 38, no. 6, June 1943, pp. 181–191. Work described was initial stage of construction of grain silo; caisson sinking was commenced in April 1940, and completed by December 1940; general description of substructure; construction and sinking of caissons;

Piling Contractors Benefit 4 Ways from Monotubes' SPECIAL FEATURES

WHEN building fast for hard-pressed war plants—and building well for postwar permanence, you can't beat Union Metal all-steel, tapered Monotubes for . . . SPEEDY DRIVING, SPEEDY HANDLING, SPEEDY INSPECTION, and SPEEDY EXTENSION.

Monotubes are so strong and rigid they require no heavy core or mandrel, and can be driven with average job equipment.

Made of cold-rolled steel, yet light in weight, they can be handled quickly and economically, and their hollow tubular design permits easy, thorough inspection prior to concreting.

Extendible Monotubes make possible the installation of varying pile lengths without delay or waste—even in low headroom.

Monotubes are available in a gauge, size and taper to meet the most exacting requirements in any soil condition. Write for Catalog 68A.

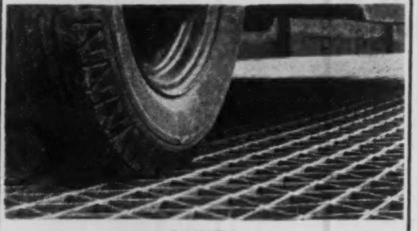
THE UNION METAL MANUFACTURING CO. • Canton, Ohio

UNION METAL

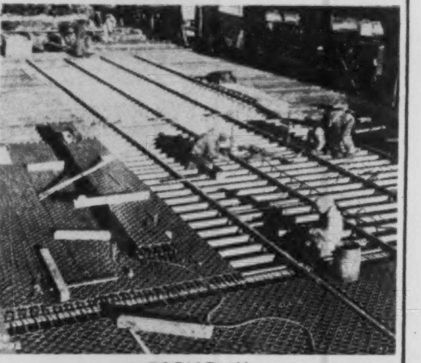
Monotube Pile Casings

IRVING DECKING

The Open Steel Bridge Pavement



SAFETY
thru Cleanliness plus Traction



ECONOMY
thru Lightweight plus Durability

IRVING SUBWAY GRATING CO., INC.
—Established 1902—
5008 27th St., Long Island City 1, New York
Foot of Park Ave., Emeryville 8, California

KEEP
THEM
BURNING
TO SPEED PRODUCTION

Return Empties Promptly—
Cylinders Are Your
Gas Supply Line

concrete mixes; estimated and actual depths of sinking; quantities of excavation; difficulties encountered during sinking; sliding of caisson during sinking; excavation for mass concrete footings; caisson cantilever caps; excavation for basement.

RESERVOIRS. Foundation Grouting of Reservoir, H. C. McCrea. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 23–24, 28. Faulty foundation under core wall of dam 15 years old made water tight; investigation and grouting methods described.

RETAINING WALLS, DESIGN. Charts and Direct Method for Design of Cantilever Retaining Walls, W. A. Jones. *Am. Concrete Inst.—J.*, vol. 15, no. 1, Sept. 1943, pp. 5–32. Method for design of retaining walls with special reference to highway field illustrated and described; suggested classification of walls is included; it touches upon selection of wall types and of earth pressure formulas and factors, and discusses and illustrates briefly preparation of charts.

MATERIALS TESTING

CONCRETE. Concrete Made with Aggregates of Uniform Size. *Concrete & Constr. Eng.*, vol. 38, no. 8, Aug. 1943, pp. 270–273. Results of series of tests on concrete with aggregates of uniform size made by U.S. Bureau of Standards; varying proportions of cement were used, but all mixes were leaner than would generally be used with normal concrete; tests were made on compressive strength, shrinkage, thermal expansion, heat transfer, bond strength, and water penetration.

CONCRETE. Machine Developed to Test Mass Concrete in Place. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, p. 537. Description of new machine developed by Cincinnati, Ohio, laboratory of U.S. Engineers, to determine dynamic modulus of elasticity of concrete for structures such as dams, highway slabs, and concrete runways.

ROADS AND STREETS

AIRPORT RUNWAYS. Cement Savings Are Indicated by Tests of Plant-Mixed Base for Airport Runways. *Construction Methods*, vol. 25, no. 9, Sept. 1943, pp. 74–75, 146. Series of tests on airport runway paving by Army Engineers to obtain comparative data on plant mixed, cement-treated base with different percentages of cement content.

AIRPORT RUNWAYS, BITUMINOUS. 700 Acres of Pavement, H. J. McKeever. *Roads & Streets*, vol. 86, no. 9, Sept. 1943, pp. 41–48. Design and construction features of desert air base in Northwest intermountain region, graded in winter; designed as heavy bombardment blind-landing field and training base, this field comprises 713 acres of paved or bituminous armor-coated surfaces; illustrations given.

AIRPORTS, CANADA. Canada's Largest Pacific Airport, W. P. Braggins. *Roads & Bridges*, vol. 81, no. 9, Sept. 1943, pp. 33–40, 68, 70. Constructional methods described; grading; concrete paving; inspection; drainage; lighting system; water and sewage; roadways; snow removal; seeding; equipment.

CONSTRUCTION. Cement-Treated Base Plus Plant Mix, A. N. Lund. *Roads & Streets*, vol. 86, no. 7, July 1943, pp. 35–38. Original route of El Camino Real has been reestablished between Bradley and King City via Jolon during past year by construction of 40 miles of highway under Calif. Division of Highways.

CONSTRUCTION. 29-Mile Streamlined Logging Road. *Roads & Streets*, vol. 86, no. 9, Sept. 1943, pp. 58, 60–62, 64. How heavy-duty truck road was built in Amador County, California, to tap new wartime lumber source; road combines elements of both automobile and logging road; roadbed was built to carry heavy emergency loads; grades and curves were provided to help move huge tonnages of logs and lumber; notes on $48,000,000 raw materials access-road program in West, of which this job is a part.

CULVERTS. Highway Committee Recommendations for Selection of Culvert Size and Type, G. A. Tilton, Jr. *Calif. Highways & Pub. Works*, vol. 21, nos. 7 and 8, July–Aug. 1943, pp. 13–15. Committee reporting to California Div. of Highways proposes that culvert and its appurtenances be balanced without freeboard for 100-year flood; procedure facilitates selection of most economic combination for particular site; balanced design providing safe passage of 100 year flood under head does not generally increase cost over current practice of providing for 10-year flood without head. Bibliography.

CURBS, CONCRETE. Pre-Cast Concrete Curb in Lee, Massachusetts, L. A. Airoldi. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 26, 34. Description of form and method of use for casting curb blocks 6 in. by 16 in. by 5 ft and cost of making and setting blocks.

DESIGN. Some Points in Connection with Design and Construction of Trunk Roads, W. Thorburn. *Surveyor*, vol. 102, no. 2689, Aug. 6, 1943, pp. 327–328. Author claims that in order to improve and speed up construction in postwar period alterations in existing method of preparing schemes will have to be considered; points that cause delay include land acquisition, too small sections dealt with at one time, financial considerations, bridge design, and lack of standard methods for road junctions on trunk roads.

EXPRESSWAYS AND PARKWAYS, PITTSBURGH. Allegheny County Improves Duquesne Way. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 540–543. Details of Duquesne way, express road along Allegheny River in Pittsburgh; to accommodate east and west through traffic, boulevard passing under all river bridge approaches was built near water front; two 30-ft roadways, separated by island in which line of Pennsylvania Railroad is carried on viaduct, were constructed farther inland and at higher level to carry local traffic.

GRAVEL. Michigan Practice in Gravel Stabilization, B. R. Downey. *Roads & Streets*, vol. 86, no. 6, June 1943, pp. 57–59. Methods used by Michigan State Highway Department as means of preserving gravel surfaces with minimum wartime effort.

HIGHWAYS SYSTEMS, CALIFORNIA. $1,000,000 Winter Highway Damage, W. A. Smith. *Calif. Highways & Pub. Works*, vol. 21, nos. 5–6, May-June 1943, pp. 12–13. Damage to state highway structures and facilities in excess of $1,000,000 occurred during past winter season; nearly three-quarters of damage was in Los Angeles and San Bernardino areas; large portion resulted from single three-day storm—Jan. 21 to 23—when 5.58 in. of rain fell in Los Angeles area and 7.23 in. In San Bernardino; debris choked subway; ocean scoured embankment; many bridges destroyed.

HIGHWAY SYSTEMS, POSTWAR. Saskatchewan Plans Extensive Postwar Highway Program, H. R. Mackenzie. *Eng. & Contract Rec.*, vol. 56, no. 38, Sept. 22, 1943, pp. 73–75. Seven special road and bridge-building projects feature detailed improvement program, which is outlined.

HIGHWAY SYSTEMS, RELOCATION. Manitoba Relocating Two-Mile Highway Entrance to Winnipeg, J. C. Irving. *Eng. & Contract Rec.*, vol. 56, no. 38, Sept. 22, 1943, pp. 70–71. Procedure described; extensive soil tests made along route and all-silt pockets eliminated to depth of 4 ft.

JOINTS. California Steps Up Mudjacking, T. H. Dennis. *Roads & Streets*, vol. 86, no. 8, Aug. 1943, pp. 40–42. Methods and costs of program to save over-loaded pavements by correcting pumping joints. From *Wartime Road Problems Bul. No. 4*, Highway Research Board, Washington, D.C.

JOINTS. Mudjacking in North Carolina, B. W. Davis. *Roads & Streets*, vol. 86, no. 8, Aug. 1943, pp. 43–44. Methods and costs of program to save overloaded pavements by correcting pumping joints.

MAINTENANCE AND REPAIR. Emergency Pavement Patching with Pre-Stabilized Soil-Aggregate Mixes, R. L. Fosburg. *Roads & Bridges*, vol. 81, no. 6, June 1943, pp. 25 and 56. Procedure described for emergency repairs of potholes and broken sections; use of graded soil-aggregate mixture containing calcium chloride found to make satisfactory temporary patch.

MAINTENANCE AND REPAIR. Hot-Mix Resurface Contract, W. H. Moore. *Roads & Streets*, vol. 86, no. 7, July 1943, pp. 39–40. Brief description of resurfacing job carried out by Ohio Improvement Company, on State Route 14.

MAINTENANCE AND REPAIR. Madison Has Long-Range Plan, T. F. Harrington. *Roads & Streets*, vol. 86, no. 7, July 1943, pp. 49–50. Outline of 6-year street project improvement plan of Madison, Wis.

MAINTENANCE AND REPAIR. Maintaining 750 Miles of Streets and Alleys, C. E. Brokaw. *Roads & Streets*, vol. 86, no. 8, Aug. 1943, pp. 35–39. Notes on Cincinnati's wartime street program; 800,000-sq yd surface treatment program; track area maintenance; surface heaters; municipal asphalt and crusher plants; two shops operated by highway maintenance division; efficient method of leaf removal; night operation held to minimum; steam cleaning of safety islands.

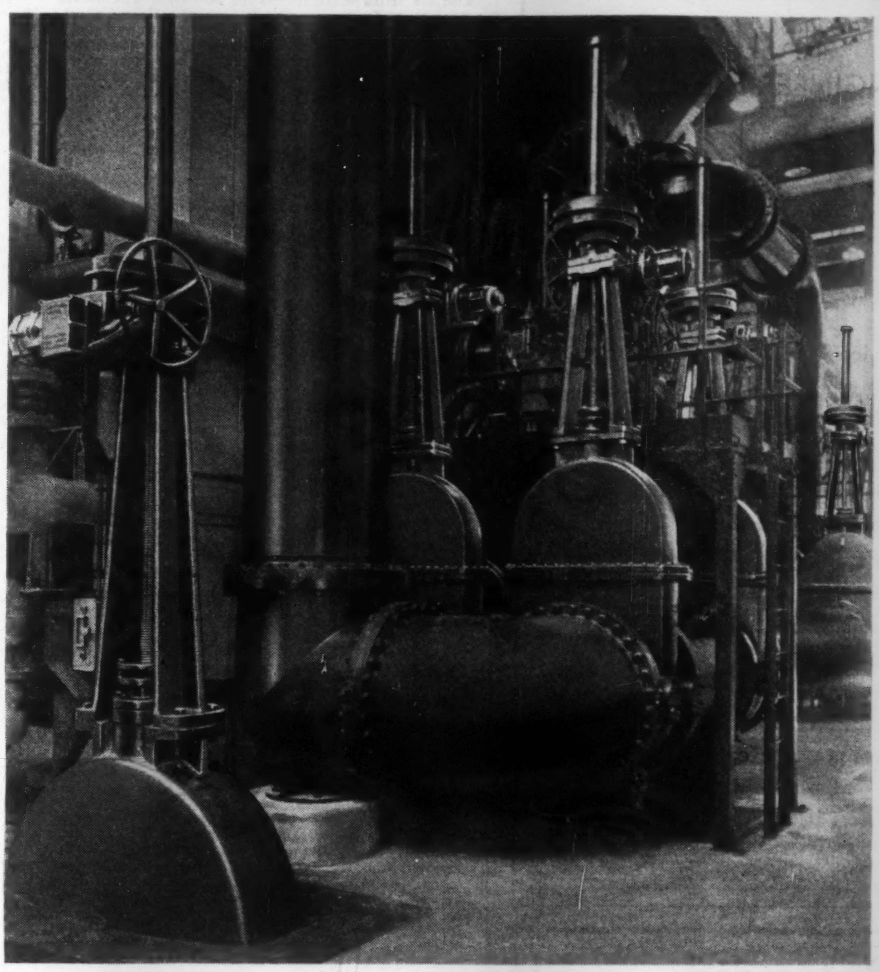
MAINTENANCE AND REPAIR. Patches Are Fashionable. *Am. City*, vol. 58, no. 8, Aug. 1943, pp. 42–43. Methods for salvaging and rehabilitating old concrete pavement described.

MAINTENANCE AND REPAIR. Shrunken Budgets Swarming Traffic Swollen Rivers, R. R. Fisher. *Roads & Streets*, vol. 86, no. 8, Aug. 1943, pp. 45–47. Discussion of wartime highway maintenance problems of Marion County, Indiana, and how they are being solved.

MEXICO. Mexico's Roads as Seen by American Engineer, J. C. Black. *Roads & Streets*, vol. 86, no. 9, Sept. 1943, pp. 49–50, 57. Brief review of Mexico's road system; maintenance; design and character of pavement; bridges and culverts; location problems; grades and curvature.

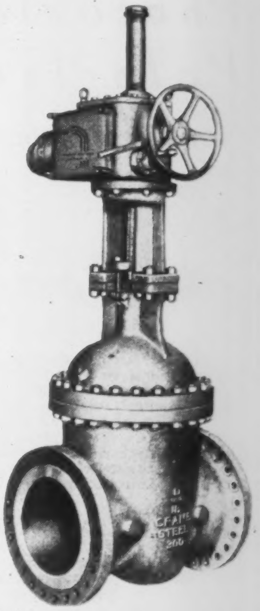
SNOW AND ICE CONTROL. Ohio Extends Use of Chemicals to Free Highways of Ice and Snow. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, p. 539. Use of raw chemicals, either sodium

For
Everday
Operation
or on
Emergency
Service . . .



LIMITORQUE VALVE CONTROLS

Always respond . . .



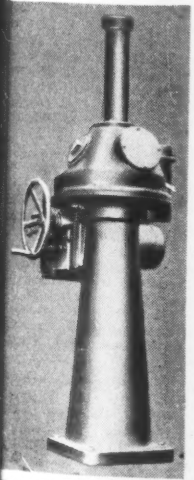
Proved Dependable—that is the reputation LimiTorque Controls have earned by the installations in many well known water works and sewage disposal plants.

Regardless of conditions, whenever a button is pushed at either a centrally located master control panel or a convenient individual push button station . . . the LimiTorque functions and the valve opens or closes as desired . . . quickly, safely. No effort is required, no time is wasted.

This makes remote operation of valves and sluice gates most practical, permits key workmen to be responsible for operating valves in all parts of the plant from one central point with a full knowledge of the status of valves at all times.

LimiTorque can be applied to all types of valves from 3" to 96" diameter . . . on either new or existing equipment.

Investigate LimiTorque today . . . write us.



Left
A Limitorque Floor Stand

PHILADELPHIA GEAR WORKS, Inc.

INDUSTRIAL GEARS AND SPEED REDUCERS LIMITORQUE VALVE CONTROLS
Erie Ave. and G St., Philadelphia 34, Pa. • New York • Pittsburgh • Chicago

FRASER-BRACE
ENGINEERING CO., INC.

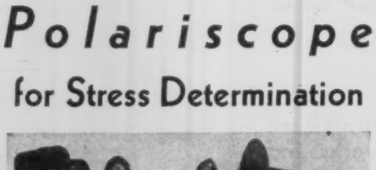
Design, Construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

REPORTS — APPRAISALS — CONSULTING

10 East 40th Street
New York 16, N. Y.

Polaroid* ...
Photoelastic
Polariscope
for Stress Determination



To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscope of $4^{1}/_{4}''$ clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit ($8^{1}/_{4}''$ aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO., Inc.
1819 Broadway, New York, N. Y.

** T. M. Reg. U. S. Pat. Off. Polaroid Corporation*

chloride or calcium chloride, in removal of snow and ice from state highways of Ohio; chemicals were spread on over one thousand miles of road, including brick, concrete, and bituminous type pavements; experiments have shown that raw chemicals, placed at proper time, are more effective than treated abrasives, such as sand or cinders.

SNOW AND ICE CONTROL. Snowiest City in North America, A. E. Perks. *Am. City*, vol. 58, no. 8, Aug. 1943, pp. 47–48. Manner in which snowfalls that total nearly 12 ft in depth, annually, are handled in Montreal, Canada.

SOIL CEMENT. Building Soil-Cement Road in Kenosha County, H. H. Herzog. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 14–15, 32. Detailed description of method of construction, using pulverized old asphalt mat as part of aggregate; list of equipment used, and cost.

STABILIZATION. Wartime Importance of Granular Stabilized Roads. *Roads & Bridges*, vol. 81, nos. 6 and 7, June 1943, pp. 26–30, 56, 58, 60, and 62; and July, pp. 33–34 and 154–156. Recommendations for their design, construction, and maintenance; selecting and combining materials for road stabilization.

SUBSOILS. Repeated Load Tests on Highway Subgrade Soil and Bases, M. S. Kersten. *Minn. Univ.—Eng. Experiment Station—Tech. Paper No. 43*, July 1943, 20 pp. Tests reported show that repeated applications of loads will increase penetration of bearing plate into soil or stabilized base material; thus bearing valves determined by single load application producing critical deflection may be too high for use in design if repeated load applications may occur.

SEWERAGE AND SEWAGE DISPOSAL

DISPOSAL PLANTS, EL SALVADOR. Treatment Plant Built of Local Materials, A. N. Carter. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 528–530. Plant constructed at San Miguel, El Salvador, under supervision of Office of Coordinator of Inter-American Affairs; end walls of settling tanks are of masonry and side walls were built of pre-cast concrete slabs without reinforcing; filter beds have masonry walls and distribution, and underdrainage systems were built of tile burned locally; volcanic material mined nearby used for filter stone.

DISPOSAL PLANTS, PRYOR, OKLA. Pryor, Okla., Meets Sewerage Emergency, R. Collins. *Am. City*, vol. 58, no. 8, Aug. 1943, pp. 56–58. Design and construction of sewage-treatment plant; existing trickling filter was reconditioned and its capacity increased; rotary distributor rebuilt; sludge is digested in two tanks designed for either single or multi-digestion; gas-tight concrete domes are provided on tanks to eliminate need for steel covers; in service line extensions, each lot connected by wye arrangement, location being carefully recorded on permanent city maps.

SANITARY ENGINEERING. Problems of Sanitary Engineer Arising from Enemy Air Attacks, G. S. McDonald. *Surveyor*, vol. 102, no. 2690, Aug. 13, 1943, pp. 335–337. Survey of possible damages to water supply and drainage facilities and details of work in reconstruction of sewers and water mains. Before Instn. Sanitary Engrs.

SEWAGE TANKS. Plain Concrete Septic Tanks for Small Housing Projects, J. Girand. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 538–539. Illustrated description of unreinforced tanks, built as arch in section so all stresses are compressive and reinforcing steel is eliminated; inlet and outlet pipes are vitrified clay tile; interior baffles are of redwood.

SLUDGE DIGESTION. Sewage-Sludge Digestion, D. L. McLean. *Water & Sewage*, vol. 81, no. 8, Aug. 1943, pp. 13–14, 36–38. Description of process of methane fermentation; factors in sludge digestion; effect of war on digestion.

TREATMENT. Two-Step Lime Addition for Sewage Coagulation and pH Control, W. Rudolfs and G. B. Nickol. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 30 and 32. Effect of lime on pH values of sewage; effect on clarification; type of lime; two-step addition. Fourth Journal Series Paper of New Jersey Agric. Experiment Station, Rutgers Univ., Dept. Water & Sewage Research, New Brunswick, N.J.

STRUCTURAL ENGINEERING

BEAMS AND GIRDERS, CONCRETE. Charts for Design of Reinforced Concrete Beams, T. Garland. *Concrete & Constr. Eng.*, vol. 38, no. 8, Aug. 1943, pp. 243–255. It is shown how simple but accurate design charts can be prepared both for T-beams and for rectangular beams with various proportions of compressive reinforcement.

BEAMS AND GIRDERS, STRESSES. Analysis of Stresses in Simple and Continuous Beams and Girders, H. L. Wagner. *Roads & Bridges*, vol. 81, no. 6, June 1943, pp. 19–23, 62, 64–72, 75. Examples and analyses that demonstrate relation of shear diagram to moment diagram in any system of loading; analysis of stresses in simple beam of uniform cross section, uniformly loaded; continuous beams of uniform cross section having spans of equal length; horizontal and vertical shear in beams and girders; web reinforcement in concrete beams; diagonal tension in concrete beams.

CHIMNEYS, DESIGN. When Building Chimneys Check These Points. *Brick & Clay Rec.*, vol. 103, no. 3, Sept. 1943, pp. 46 and 48. Suggestions for proper construction of chimneys; area and height must be coordinated; straight chimney with round flue is most efficient; walls need 4-in. thickness plus flue lining; make cap as large as lining.

FRAMED STRUCTURES, CONCRETE-WOOD. Pre-cast Columns and Timber Bents Combined for Rigid Frames. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 535–537. To save critical materials in 80 by 240-ft one-story industrial building, combination timber and concrete design was developed in which reinforcing and structural steel totaled only 3.5 lb per sq ft of building area.

TUNNELS

CONSTRUCTION, CONCRETE LINING. Tunnel Linings, with Special Reference to New Form of Reinforced Concrete Lining, G. L. Groves. *Instn. Civ. Engrs.—J.*, no. 5, Mar. 1943, pp. 29–42, (discussion) 42–64, supp. plate. Describes new form of pre-cast, reinforced concrete lining; notes on various lining materials; design and manufacture of new lining used in Ilford tube.

WATER PIPE LINES

CLEANING. Scraping of Large Water Mains, J. F. Bailey. *Water & Water Eng.*, vol. 46, no. 567, Aug. 1943, pp. 317–322. Reconditioning of mains by scraping; description of complete scraping assembly; methods of scraping cast-iron mains; scraping one section of siphon; brushing steel mains. Before Instn. Water Engrs.

DISINFECTION. Disinfection of Mains at Ottawa, H. R. Stockwell. *Water & Sewage*, vol. 81, no. 8, Aug. 1943, p. 19. Description of trailer-mounted portable chlorinator; manual control, vacuum, solution feed, type MSVD; maximum capacity 300 lb of chlorine per 24 hours; used to disinfect all new water mains before they are placed in service.

PORTABLE. How Army Gets Water. *Water & Sewage*, vol. 81, no. 8, Aug. 1943, pp. 15 and 38. Description of portable pipe line having capacity of 252,000 gal per day; pipe line is made in 20-ft sections, 4 to 6 in. in diameter, and can be laid at rate of 10 to 30 miles per day; experience with lines.

WATER RESOURCES

UNDERGROUND. New Trends in Ground Water Development, R. Nebolsine. *New England Water Works Assn.—J.*, vol. 57, no. 3, Sept. 1943, pp. 186–200. Description of methods for collecting ground water from unconsolidated formations; early history of ground-water abstraction methods; phases of horizontal screen process and solutions; examples of installations and performance; field for future research.

WATER TREATMENT

CHLORINE DETERMINATION. Colorimeter Determination of Chlorine Residuals up to 10 Ppm. with Ortho-tolidine, N. S. Chamberlin and J. R. Glass. *Am. Water Works Assn.—J.*, vol. 35, no. 9, Sept. 1943, pp. 1205–1221. Standards prepared for residuals up to 10 ppm; standards for residuals above 1.5 ppm at cell depths less than 240 mm not prepared by proportional dilution; standards are 0.1 M with respect to phosphate buffer. Bibliography.

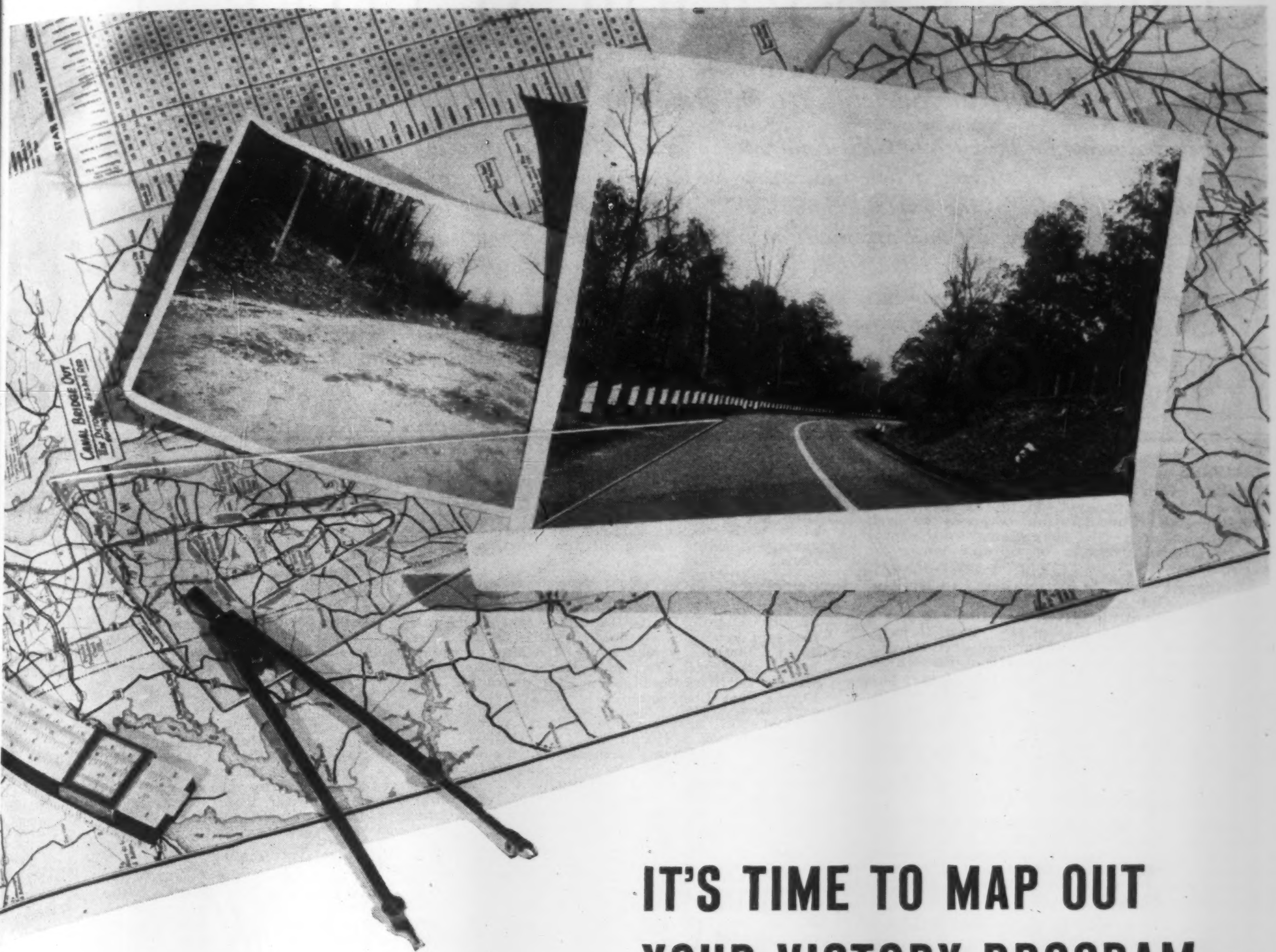
WATER ANALYSIS. Rapid Tests of Water Quality, F. W. Gilcreas. *Am. Water Works Assn.—J.*, vol. 35, no. 9, Sept. 1943, pp. 1201–1204. Discussion of orthotolidine test for residual chlorine, flash test for active chlorine; "drop-dilution" method for residuals greater than 1 ppm; determination of chlorine demand; determination of pH value.

WATER CHLORINATION. Estimation of High Chlorine Residuals, A. E. Griffin and N. S. Chamberlin. *Am. Water Works Assn.—J.*, vol. 35, no. 5, May 1943, pp. 571–578. Purpose of discussion is to demonstrate fallacy of cherry red color as indicative of high chlorine residuals; how this criticism can be used constructively to devise methods for determining such residuals quantitatively; chemical reactions that confirm these findings and methods themselves. Bibliography.

WATER WORKS ENGINEERING

DISTRIBUTION SYSTEMS, FARGO, N. DAK. Waterworks Distribution Systems in Wartime, W. P. Tarbell. *Water & Sewage*, vol. 81, no. 8, Aug. 1943, pp. 24, 39–40. Considers seven major efforts to level off peak loads, reduce wastage, postpone extension, reduce power costs, and meet increasing loads with minimum of labor and material; pitometer or leak surveys; water-main cleaning; distribution surveys; elevated storage; auxiliary supplies; looping and short feeders; eliminating flush tanks. Before Am. Water Works Assn.

WATER WELLS, DRILLING. Some Aspects of Driven Well Construction, H. R. Shipman. *Pub. Works*, vol. 74, no. 9, Sept. 1943, pp. 16–18. Methods considered and one finally adopted for eliminating pits at head of driven wells; reconstructing existing wells to conform to this plan.



IT'S TIME TO MAP OUT YOUR VICTORY PROGRAM

IN THE new era of transportation that will be demanded after this war is won, the first responsibility of enlightened highway planners will be the construction, maintenance and repair of local or feeder roads. These secondary roads are not only essential for efficient local travel, they must also furnish easy access to and from the great primary routes—by land, by sea and by air.

Providing them—quickly and in sufficient volume—will give America's highway officials the greatest construction job of all time.

It's none too soon to consider your own part in the Victory picture—your own post-war plans.

Why not talk them over with the Tarvia field man? He has at his command all Barrett's 40 years of successful paving experience. He can show you how you can use Tarvia with local materials and local labor to get the most miles of smooth, easy-riding, skid-safe road from the appropriation available. He can prescribe the right grade of Tarvia and the right Tarvia method for almost any type of pavement—to satisfy almost any traffic requirement.

Phone, wire or write our nearest office—and ask the Tarvia field man to call, soon.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N. Y.

New York • Chicago • Birmingham • St. Louis • Detroit • Philadelphia • Boston
Providence • Rochester • Minneapolis • Cleveland • Columbus • Toledo
Youngstown • Syracuse • Buffalo • Cincinnati • Bethlehem • Portland, Me. • Bangor, Me.
Norwood, N. Y. • Cromwell, Conn. • Norwich, Conn. • Savannah, Ga. • Norfolk, Va.
In Canada: THE BARRETT CO., LTD. Montreal • Toronto • Winnipeg • Vancouver

. . . ONE OF AMERICA'S GREAT BASIC BUSINESSES

Barrett Tarvia*

*Trade-mark Reg. U. S. Pat. Off.

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the articles from your own file, from your local library, direct from the publisher, or they may be borrowed from the Engineering Societies Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Arch. Arch Curve, W. A. Fairhurst. *Concrete & Constr. Eng.*, vol. 38, no. 10, Oct. 1943, pp. 309–320. Consideration is given to arch curves and arch rib dimensions, and simple theory governing choice of suitable curve for particular arch.

Concrete Arch, Maintenance and Repair. Forty-Year-Old Concrete Bridge Is Reconstructed by Guniting, J. H. Brayton. *Concrete*, vol. 51, no. 10, Oct. 1943, p. 14. Brief description of work on twin-arch unreinforced railway bridge across Vermilion River at Danville, Ill.

Design. Computations for Influence Lines Simplified by Semi-Graphical Method, C. J. Posey. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 911–912. Method of computation in connection with problem of heavy and unusual loadings, such as special industrial or military traffic, on bridges designed for ordinary loads.

CITY AND REGIONAL PLANNING

Chicago. Planning for Chicago After War. *Western Soc. Engrs.—J.*, vol. 48, no. 3, Sept. 1943, 117–126. Panel discussion including following papers: Chicago Zoning Ordinance, A. Lindell; Housing Plan for Chicago, E. Woods; and Chicago Master Plan, H. Hoyt.

Lessons from the Blitz. Town Planning Lessons of Fire Blitz, E. L. Bird. *Nat. Fire Protection Assn.—Quarterly*, vol. 37, no. 2, pt. 1, Oct. 1943, pp. 100-110. Discussion of relationship between town planning and air attack.

Standards for Residential Developments. Standards of Residential Development and Redevelopment, R. Nicholas. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 3, Sept. 14, 1943, pp. 81–93. Standards which should be adopted in relation to adequate siting of residential buildings in relation to one another, also to architectural and health requirements in regard to setting and provision of essential air and light, and provision of adequate organized games areas, children's play grounds, rest parks, school playing areas, community center facilities, etc.

CONCRETE

Airport Runways. "Black Top" for Paving Iowa Airfield Mixed, Laid During Coldest Weather. *Pit & Quarry*, vol. 36, no. 4, Oct. 1943, pp. 69–70. Notes on Ottumwa Naval Air Station project; paving included two concrete runways for heavy planes and two octagonal landing mats, and drill field of bituminous construction; each mat required 35,000 tons of bituminized aggregates; aggregates for concrete runways and for other concrete construction were batched at four plants which, with asphalt plant, are at railway siding 4 miles from project; batching, handling, transport, and laying practice.

Ammunition, Storage Depots. Simplified Design for Munitions Igloos. *Eng. News-Rec.*, vol. 131, no. 19, Nov. 4, 1943, pp. 676–681. Heavy-bar pattern of reinforcing in standard Igloo changed to one layer of mesh; bar truss skeleton of beehive eliminated; construction operations.

Beams and Girders. One Deformation of Reinforced Concrete Structures and on Calculation of Pre-Stressed Reinforced Beams, E. Volterra. *Structural Engr.*, vol. 21, no. 4, Apr. 1943, pp. 123–128, supp. sheet. Problem of pre-stressing reinforced concrete beams in such manner as to enhance their stability is dealt with and simple analytical solution is described. Bibliography.

Culverts. No Steel in Kansas Concrete Culverts, T. W. Oliver. *Eng. News-Rec.*, vol. 131, no. 13, Sept. 23, 1943, pp. 484–488. Carefully designed for varying loads and lateral pressures, culverts are economically constructed, costing very little more than reinforced concrete structures; earth backfill is properly placed and compacted to avoid excessive stresses even under heavy loads and high embankments; plain concrete footings supporting arch barrels are placed below stream bed to prevent scour.

Ready-Mixed Concrete Plants. No Delays for Winter, R. S. Torgerson. *Rock Products*, vol. 46, no. 10, Oct. 1943, pp. 68–70. Certified Concrete Company, St. Paul, Minn., equips plant with efficient systems for heating aggregates and water during sub-zero weather conditions.

CONSTRUCTION INDUSTRY

Military Entineering, Supply Depots. Supply Depot Built Rapidly. *Western Construction News*, vol. 18, no. 9, Sept. 1943, pp. 389–391. Short description of construction of warehouse structures, railroad, water supply and sewage facilities, and paving, for depot for Air Forces near Los Angeles.

Postwar. Construction After War. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 616–619. Statements by G. A. Bryant, L. Kahn, and M. C. Tuttle on probable trends in postwar buildings and construction; need for increased building capacities in certain industries; future of war plants; work in foreign countries; building designs in postwar period.

DAMS

Concrete Gravity, Arkansas. Truck Shuttle Service Speeds Cableway Handling Concrete for Norfolk Dam. *Construction Methods*, vol. 25, no. 10, Oct. 1943, pp. 62–65, 134, 136, 138. By cutting 1,350 ft off cableway haul of concrete going into left half of dam—1,500,000 cu yd of straight gravity structure $^1/_2$ mile long across river in Arkansas—truck shuttle service, operating between mixing plant transfer and hopper car on dam, increased speed of concrete placement by 50% and stepped up overall concrete progress by 22%.

Crushed Stone Plants, Tennessee. Bridge Conveyors Take Fontana Dam Aggregate Across River to Sizing Plant and Back to Concrete Plant, W. E. Trauffer. *Pit & Quarry*, vol. 36, no. 4, Oct. 1943, pp. 54–62, 74–75. In building 16 Dams, Tennessee Valley Authority has designed and operated many aggregates plants; latest crushed stone plant at Fontana Dam incorporates earlier plants and many new ideas; detailed description of principal features of plant and practices.

Earth, California. Earthfill Flood Control Dam, J. G. Morgan. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 441–445. Description of Sante Fe dam, $4^1/_2$-mile earth embankment halted by WPB order when 95% complete; five zones determined by size and quality of material and method of placing; largest grizzlying operation in West, approximately 90% of material grizzlied into two sizes, under and over 6 in.; concrete only on outlet works structure and spillway; list of material and equipment used; illustrations.

Reservoirs, Los Angeles. Small Reservoir Is Enlarged. *Western Construction News*, vol. 18, no. 7, July 1943, pp. 300–301. Description of project increasing Los Angeles Elysian Reservoir from capacity of 32 to 128 acre ft—by construction of compacted earth-fill dam approximately 350 ft downstream from former location of barrier.

Reservoirs, Protection. Protective Concealment for Reservoirs and Exposed Aqueducts. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 595–597. Experiments with smoke screens laid over reservoirs to prevent light from being reflected upward from water surface have developed data on effective methods, including characteristics of smoke layer under different wind velocities and sources of smoke; hourly cost of smoke production also is made available.

Reservoirs, Roofs. Reservoir Roof of Unreinforced Arches. *Eng. News-Rec.*, vol. 131, no. 13, Sept. 23, 1943, pp. 479–481. To save steel in constructing water supply improvements at Springfield, Vt., reservoir was built with walls, columns, and roof all of plain concrete, roof consisting ot series of groined arches; after walls had been constructed for greater part of their height and columns to full height, roof was built in alternate sections; floor, also free of steel, was added last.

FLOOD CONTROL

Levees, Erosion Control. Permeable Dikes Built of Wire Fencing. *Eng. News-Eec.*, vol. 131, no. 19, Nov. 4, 1943, pp. 674–675. To halt erosion by Little Miami River along Municipal Airport, Cincinnati built permeable dikes by nailing heavy wire fence to timber piles on 8-ft spacing; overflow rock-fill training wall built to withstand ice action.

FLOW OF FLUIDS

Flow of Water, Measurement. Salt-Velocity Gagings of Flow in Delaware Water Tunnel. *Water Works Eng.*, vol. 96, no. 18, Sept. 8, 1943, pp. 1020–1021. Rate of flow determined by measuring time of travel of salt-laden water from introduction to given point downstream; description of methods used by New York City Board of Water Supply.

FOUNDATIONS

Buildings. Sao Paulo Tower Is Righted with Jacks. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, p. 623. 24-story office building in Sao Paulo, Brazil, that leaned more than 2 ft out of plumb, when one corner of the foundation settled, has been righted by ingenious means involving freezing of subsoil, installation of deep concrete piers, and hyraulic jacking.

Shipyards, Basins. Cellular Cofferdam Serves as Wall of Ship Construction Basins. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 588–594. Dravo Corp. used sheet-pile cells originally planned for enclosing cofferdam as wells of ship construction ways built below water; "sandpiles" were used to stabilize and drain cells of wall; tremie concrete, on wood piling driven far under water, comprises basin floor; at outshore end, floating caisson gates were built in place inside box cofferdam made of vertical 36-in., 350-lb beams, and Z-piling.

Soils, Mechanics. Soil Studies Aid to Design, D. R. Warren. *Western Construction News*, vol. 18, no. 9, Sept. 1943, pp. 409–410. Examples given, illustrating necessity for soil investigations prior to construction.

Towers. Design of Foundations for Stacks and Towers, V. O. Marshall. *Petroleum Refiner*, vol. 22, no. 10, Oct. 1943, p. 352. Discussion, by S. Garnett, of paper previously indexed from issue of Aug. 1943; opinion is stated that backfill should not be counted on for stability, except where it is clearly a permanent part of structure.

HYDROELECTRIC POWER PLANTS

Penstocks, Welded Steel. Penstock Welded on High Dam, G. L. Yetter. *Western Construction News*, vol. 18, no. 7, July 1943, pp. 306–308. Construction of five penstock systems on northern California dam found to be much cheaper, as well as stronger, by welding joints rather than riveting; joints tested by X-ray machines, then subjected to high hydrostatic pressures.

IRRIGATION

Mexico. Mexico Develops Irrigation, A. Orive Alba. *Western Construction News*, vol. 18, no. 9, Sept. 1943, pp. 400–401. Projects planned and in construction by Commission of Irrigation; need for irrigation in Mexico.

LAND RECLAMATION AND DRAINAGE

Great Britain. Land Drainage in England and Wales, J. T. Olsen. *Agric. Eng.*, vol. 24, no. 9, Sept. 1943, pp. 297–298, 303. Drainage program; organization for drainage; note on Land Drainage Act of 1930; rehabilitation of farm drainage systems. Before Am. Soc. Agric. Engrs.

"CATERPILLAR" DIESELS ARE

WORTH WAITING FOR!

RIGHT NOW, "Caterpillar" production is bigger than it ever was in peacetime. But when the Armed Forces have taken the machines they need, there are nowhere near enough left to meet the world-wide demand. The War Production Board is allocating the available balance among civilians whose work is essential to the war effort. Thousands of other prospective purchasers are asked to wait for their new "Caterpillar" Diesel equipment — but it will be *worth waiting for.*

"Caterpillar" Diesel Tractors, Motor Graders, Engines and Electric Sets have been good in the past. They will be better in the future — *proved* on the battle fronts of this war. They'll have the same ruggedness and simplicity, the same economy and dependability you have always known and liked.

When victory comes, "Caterpillar" production lines will keep right on rolling them out. You'll buy your new "Caterpillar" Diesels from the same trusted dealer who knows your problems.

With his help in servicing and maintaining your old machines, you can afford to wait for the equipment that is your first choice.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR
REG. U.S. PAT. OFF.
DIESEL

TO WIN THE WAR: WORK—
FIGHT—BUY U. S. WAR BONDS!

THE FIGHTING FOUR

INSPECT Look your equipment over frequently. For expert "internal" inspection of operating parts or functions, call in a trained "Caterpillar" service man. Read your Operator's Instruction Book.

LUBRICATE Use the right oil at the right time in the right place and in the right quantity. Keep the oil clean—change before it becomes dirty and deteriorated. Follow the Operator's Instruction Book.

ADJUST Tighten all bolts. Keep fan belt and tracks at proper tension. Read the Operator's Instruction Book. For fuel injection valves and other precision adjustments, let your experienced service-dealer do the work. He'll do it well.

REPLACE Have your service-dealer replace or repair worn bearings, track rollers, pins and bushings, sprockets, cylinder liners, clutch linings. His service helps restore power and extend equipment life. Saves critical materials, too.

Ground-Water Studies. Ground-Water Studies in Relation to Drainage, J. E. Christiansen. *Agric. Eng.*, vol. 24, no. 10, Oct. 1943, pp. 339–342. Irrigation and drainage census shows that drainage works have been constructed on about 3 million acres, and that like area is irrigated wholly or partially by pumping from wells; research at U.S. Regional Salinity Laboratory is directed toward studies that have general application to salinity problem, including development of methods and equipment that can be used by respective states in solution of their specific problems. Bibliography. Before Am. Soc. Agric. Engrs.

Terracing. Bluegrass Terrace Outlet Channels, D. D. Smith. *Agric. Eng.*, vol. 24, no. 10, Oct. 1943, pp. 333–336, 342. Report on bedslope experiments on bluegrass sod, carried out at Soil Conservation Experiment Station near McCredie, Mo.; few comments on channel cross section and grass age experiments.

Venezuela. New Reclamation Era in Venezuela, W. L. Powers. *Agric. Eng.*, vol. 24, no. 10, Oct. 1943, pp. 345–346. Officials have under way new reclamation era; brief details of six projects studied during past eight months, with reference to classifications and selections of irrigable land.

MATERIALS TESTING

Concrete Reinforcement. Tests on Square Twisted Steel Bars and Their Application as Reinforcement of Concrete, K. Hajnal-Konyi. *Structural Engr.*, vol. 21, no. 9, Sept. 1943, pp. 327–368. Properties and use of material, obtained from mild steel by method known as work-hardening process; method consists in straining mild steel bar in cold state far beyond its yield point so as to give it permanent deformation; it can be applied to bars of various cross sections; present paper deals only with square bars subjected to twisting process. Bibliography.

Soils. Field Soil Tests, J. G. Joslin. *Military Engr.*, vol. 35, no. 214, Aug. 1943, pp. 387–391. It is important that subgrade compaction, embankment compaction, base coarse grading and compaction, and soil aggregate stabilized surface coarses be constructed according to specifications; field soil tests described in this article have been found very satisfactory for highway construction in state of Ohio and should be useful on military projects such as runways, roads, and other types of construction.

PORTS AND MARITIME STRUCTURES

Scotland. Greenock Harbour, D. Smith. *Dock & Harbour Authority*, vol. 24, no. 275, Sept. 1943, pp. 99–101. Proposals for postwar development of port of Greenock as set out in Report to Harbour Trustees, essential sections of which are given; alternative bases for development; transatlantic services; existing accommodation; air transport base; passenger traffic; proposed naval base; rail connections; navigable channel.

ROADS AND STREETS.

Airport Runways. Suggested Method of Sealing Runways, H. C. Broyles and W. B. Allen. *Military Engr.*, vol. 35, no. 213, July 1943, pp. 336–337. "Fiber-Bituminous Method" described for sealing runways, dispersal roads, and parking bays; experimental strips have been constructed using combination of bituminous material, burlap or canvas, and sand; strips have proved successful in that they are waterproof, have good non-skid wearing surface, and can be constructed quickly.

Asphalt. Asphalt Concrete Paving for Roads and Parking Areas, F. E. Robbins. *Military Engr.*, vol. 35, no. 215, Sept. 1943, pp. 454–456. Design specifications of asphaltic concrete paving mix for roads and parking areas in northeastern army camp; construction methods outlined.

Construction Equipment. Track Gangs and Road Crews Use Power Machines on Large Navy Project. *Construction Methods*, vol. 25, no. 10, Oct. 1943, pp. 60–61. Illustrations of power equipment used in construction of 42 miles of railroad track and 1,000,000 sq yd of stone macadam pavement for supply depot; illustrations and brief description of equipment used, including tie tampers, crane, adjustable spreader, hydraulic track jack, mixers tandem roller, and track wrench.

Expressways and Parkways, Los Angeles, Calif. Los Angeles Plans Freeways. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 457–458. Discussion of need, policy, plan; feeder system; standards.

Expressways and Parkways, San Francisco. El-Way Proposed for San Francisco. *Western Construction News*, vol. 18, no. 8, Aug. 1943, pp. 359–360. Proposal for elevated highway to loop central district to relieve congestion.

Highway Lighting. Postwar Planning Should Include Highway Lighting, G. G. Cousins. *Eng. & Contract Rec.*, vol. 56, no. 44, Nov. 3, 1943, pp. 12–13, 24. Article stresses importance of adequate lighting for heavy traffic arteries in order to reduce accident fatalities; conditions of past that need rectification for future; note on development of street and highway lighting equipment.

Highway Systems, Illinois. Express Highway With Flexible Traffic Lanes. *Transport World*, vol. 94, no. 3014, Oct. 14, 1943, pp. 271–275. Detailed description of new and divisible express highway completed in Chicago, which provides additional lane for incoming morning traffic; six vehicles abreast can travel inwards and two outwards.

Maintenance and Repair. Effect of Calcium Chloride Admixture on Strength of Concrete Cured at Low Temperatures, H. W. Russell. *Roads & Streets*, vol. 86, no. 7, July 1943, pp. 45–48. Results of investigation carried out by Illinois Division of Highways; materials, mixtures, and procedure; effect of calcium chloride on consistency of concrete; flexural strength data; modified cube strength; applicability of data; conclusions.

Military Engineering. Army Engineers Pave Way. *Compressed Air Mag.*, vol. 48, no. 8, Aug. 1943, pp. 7105–7117. General commentary on accomplishments of U. S. Army Engineers, with special reference to road and runway building, pontoon bridge building, and ferrying of heavy equipment.

Military Engineering, Supply Routes. Beating a Path to Russia's Back Door, W. G. Bowman. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 520–527. Story of engineering and construction work in building supply route from Persian Gulf through Iran to Russia; port facilities, roads, railroads, airfields, repair shops, truck and plane assembly plants, camps, and communication lines have been built under punishing climatic conditions.

Road Materials, Soil Cement. Paving with Soil and Cement, M. D. Catton. *Compressed Air Mag.*, vol. 48, no. 11, Nov. 1943, pp. 7184–7188. Review of research conducted, culminating in development of method of mixing soil and cement to produce low-cost paving material; field trials; application to construction of airport runways.

Snow and Ice Control. Snow Clearing in Ontario Counties. *Eng. & Contract Rec.*, vol. 56, no. 41, Oct. 13, 1943, pp. 30–33. Symposium of four papers: Hastings County to Keep Open 250 Miles of Difficult Roads, W. Langlois; Two Airports Necessitate Extra Clearing in Prince Edward County; Snow Control in Bruce County, G. E. Stephenson; Waterloo County Finds Heavy Equipment Most Economical, D. J. Emrey.

Soil Cement. Army Builds Soil Stabilized Roads in Great Britain. *Eng. & Contract, Rec.*, vol. 56, no. 44, Nov. 3, 1943, p. 15. Mixing cement with soil on site, U. S. Army Engineers built one-half of 2-ft roadway per day with crew of 50 men; pictorial presentation, with brief descriptive data, of procedure followed.

SANITARY ENGINEERING

Wartime. Community Sanitation in Wartime, A. D. Weston. *Water Works & Sewerage*, vol. 90, no. 9, Sept. 1943, pp. 337–339. Excerpts from paper before Massachusetts Public Health Assn.; problems of water supply, sewerage, and sewage disposal, stream pollution, assistance to armed forces, civilian defense, and personnel.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. Summary of Experience in Diffused Air Activated Sludge Plant Operation. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 909–936. Data furnished by 24 plant superintendents and chemists; practical methods of controlling principal operating variables, include concentration of mixed liquor solids, rate of sludge return, rate of air application, aeration period, and condition of sludge.

Aeration. Fish Ladder Aerator Improves Supernatant Liquor, B. Rowntree. *Sewage Works Eng. & Mun. Sanitation*, vol. 14, no. 9, Sept. 1943, pp. 415–416. Carmel, Calif., sewage-treatment plant problem of getting supernatant clear enough to discharge into clar-flocculator met by use of aeration; description of plant and equipment.

Chlorination. Effect of Break-Point Chlorination on Biochemical Oxygen Demand of Sewage, G. Groff and G. M. Ridenour. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 847–856. Review of previous investigations; present study made to determine applicability of superchlorination to sewage treatment and to determine effect of chlorine in excess of that considered practical on BOD of both oxidized and settled sewage. Bibliography.

Disposal Plants, Detroit, Mich. Two Years Operation of Detroit Sewage Treatment Plant, W. M. Wallace and C. A. Habermehl. *Mich. Eng. Experiment Station—Bul. No. 98*, vol. 19, no. 1, July 1943, pp. 29–41. Description of pumping station, rakings and grit removal, sedimentation, sludge digestion, gas engine, elutriation tanks, sludge filtration, incineration, chlorination, and laboratory activities.

Disposal Plants, Landscaping. Landscaping sewage Treatment Plants and Sewers, I. R. Riker. *Pub. Works*, vol. 74, no. 10, Oct. 1943, pp. 17–18, 50. What Princeton Borough, New Jersey, has done to make the grounds of its treatment plant a matter of local pride, and to conceal scars of sewer laying across private land.

Disposal Plants, Toronto, Ontario. Sewage Problems at Toronto. *Water & Sewage*, vol. 81, no. 10, Oct. 1943, pp. 17, 44, 46, 48–50. Discussion by Board of Control of temporary measures to improve Morely Avenue disposal works pending completion of new plant; problem of killing bacteria in sewage effluent heavily polluted with suspended solids; chlorination.

Disposal Plants, Toronto, Ontario. Toronto Sewage-Treatment Plant. *Water & Sewage*, vol. 81, no. 9, Sept. 1943, pp. 20–22, 46. Report of council meeting at which contract was awarded for first units; project in three sections; history of the project.

Filtration. Rotary Vacuum Filtration of Sludge and Effect of War on Operation, J. T. Lynch and U. T. Mann. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 807–816. Experiences at two plants—one at Auburn, N.Y., using raw sludge and one at Cortland, N.Y., handling digested sludge; description of vacuum filter; notes on equipment; chemicals; mixing of chemicals; determination of chemical dose; filter operation; cloths; records; problems; advantages of vacuum filtration; effect of war on operation. Before N.Y. State Sewage Works Assn.

Freeport, L. I. Operation of Freeport, Long Island, Sewage Treatment Plant Before and After Improvements, E. C. McKeeman. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 828–838. Description of plant, improvements made, operating problems and procedures; sewerage system; sewage treatment works; safety provisions; plant organization.

Military. Sewage Treatment at Military Installations, B. F. Hatch. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 839–846. Discussion of design, methods of construction, and operation of plants.

Odor Control. Ventilation Features of Minneapolis–St. Paul Sewage Treatment Plant, G. J. Schroepfer. *Water Works & Sewerage*, vol. 90, no. 10, Oct. 1943, pp. 353–358. Description of plant and methods of odor control; sewer scavenging and ventilation of screen and grit chambers.

Refuse Disposal, Digestion. Dual Disposal at Two Midwestern Cities, S. L. Tolman. *Sewage Works Eng. & Mun. Sanitation*, vol. 14, no. 11, Nov. 1943, pp. 529–533, 552. Examination of operating records of plants treating combined garage and sewage solids at Findlay, Ohio, and Marion, Ind.; advantages and disadvantages of combining operations.

Sewage Tanks. Inlet and Outlet Design for Sedimentation Tanks, J. H. L. Giles. *Sewage Works J.*, vol. 15, no. 4, July 1943, pp. 509–514. Suggestions for obtaining greater efficiencies from present sewage sedimentation tanks; illustrated description of designs of simple inlets and outlets; modifications of simple inlets and baffles; examples of major improvements to inlet and outlet design. Bibliography. Before New England Sewage Works Assn.

Sewers, Maintenance and Repair. Cracked Sewer Is Blanketed. *Western Construction News*, vol. 18, no. 9, Sept. 1943, pp. 397–398. 20-year-old north outfall of city of Los Angeles is being covered with 12-in. reinforced concrete blanket to strengthen sections cracking because of overload and of unstable foundation on sand hills.

Sewers, Design. Sewer Charts Based on Scobey's Formula, P. E. Whittington. *Eng. News-Rec.*, vol. 131, no. 15, Oct. 7, 1943, pp. 548–750. Three charts that permit rapid graphical solution to problems of sewer design by use of Scobey formula; selection of proper coefficient of friction determines chart to be used; once this choice is made, only two of four variables, slope, capacity, velocity, and diameter, need be known to solve problem.

Sludge. Effect of Temperature on Sludge Concentration, W. Rudolfs and R. P. Logan. *Sewage Works J.*, vol. 15, no. 5, Sept. 1943, pp. 894–907. Studies made on fresh solids and ripe sludge; rate of compacting increases with increasing temperatures, fresh solids compacting at different rate from ripe sludge; optimum temperature for fresh solids concentration about 37 C, for ripe sludge 55 C.

Water Pollution. Solving Wartime Pollution Problems with Minimum Use of Strategic Materials, C. L. Siebert and F. B. Milligan. *Sewage Works J.*, vol. 15, no. 4, July 1943, pp. 615–624, (discussion) 624–628. Simple and elementary methods of sewage and waste treatment that have proved efficient over long years of experience; much strategic material can be saved by use of some of tried and true methods and devices; authors review some of older methods and suggest substitute devices for those not available at present. Before Pa. Sewage Works Assn.

Water Pollution, California. Sanitary Engineers Report on Ocean Pollution by L. A. Sewer. *Western Construction News*, vol. 18, no. 9, Sept. 1943, p. 399. Summary of report of investigation in Santa Monica Bay, of water pollution caused by sewage disposal from Hyperion outfall of Los Angeles city sewer system.

This Pantograph Shoe of High-Chromium Iron Lasted 10 Years

TEN YEARS of sliding metal on metal is a severe test for any abrasion-resistant material. But that is the record of this pantograph shoe, the trolley contact for a mix car in a metallurgical plant. After 10 years the shoe made of about 27 per cent chromium iron is still in service. Shoes of other grades of hardened steel on the same job last four months.

Iron castings of 26-28 per cent chromium outperform other commonly used wear-resistant metals and alloys in applications involving extreme wear . . . particularly where there is considerable abrasion without undue shock. These castings are unusually easy to cast.

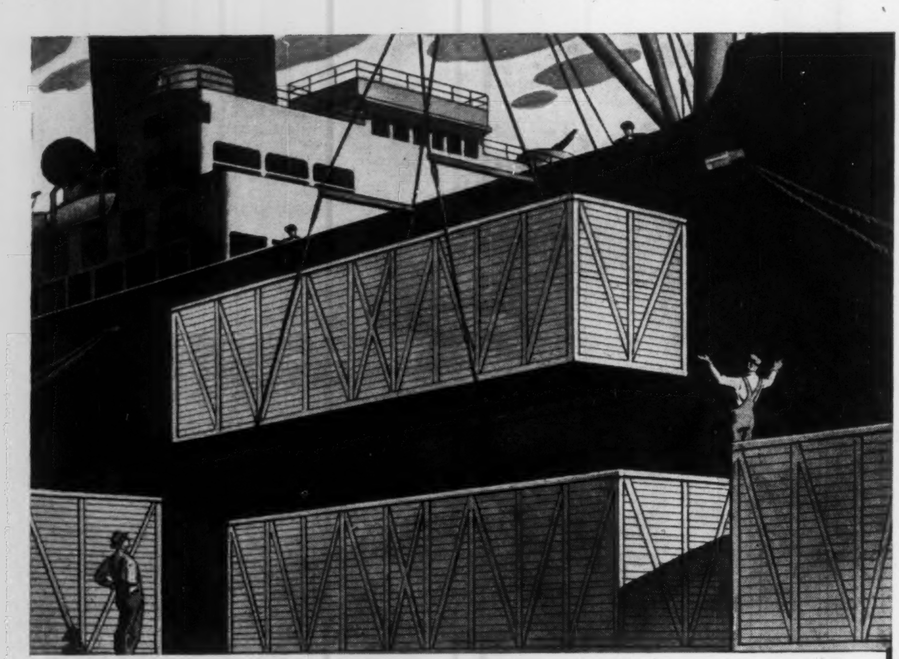
Castings of high-chromium iron have given outstanding service in dredge-pump liners, sludge-pump liners for oilwell drilling, equipment for coke crushing, screening, and conveying systems, and rock-handling equipment such as crusher jaw plates, crusher rolls, and chute liner plates.

We do not make steel, but we produce the chromium and other ferro-alloys that give steels long life. Our metallurgists have a broad background of 35 years' experience with alloy steels, both in the laboratory and in the field. If you have a question on the selection or use of an alloy steel, consult us.

★ *BUY UNITED STATES WAR BONDS AND STAMPS* ★

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals



Why not flame-proof the wood
that goes into packing cases?

Flame-proofed lumber, used in the cases carrying war materials overseas, would greatly lessen the hazard of fire aboard ships and in storage. Here's insurance against fire for every trip these returnable cases make, at only the slight additional cost of the original treatment for the wood.

Minalith* fire retardant, driven deep into the wood by vacuum-pressure treatment, makes ordinary wood flame-proof. It does not support combustion or spread fire. Structural members retain their high strength without sudden collapse when exposed to flame. This flame-proofed lumber has been widely used in the war effort; for warehouses, blimp hangars, and the like.

Wolmanized Lumber*, the wood that's impregnated with Wolman Salts* preservative, has found even wider use in wartime construction. From U. S. training camp to farthest military outpost, this pressure-treated wood is safeguarding structures against decay and termite attack.

Postwar builders will find both of these types of treated lumber similarly valuable. And all of the usual advantages of building with wood are retained. American Lumber & Treating Company, 1654 McCormick Building, Chicago 4, Illinois.

*Registered trade marks

WOOD THAT'S Alloyed FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

Water Treatment. Application of Ferric Salts in Water and Sewage Treatment, F. K. Burr. *Water Works & Sewerage*, vol. 90, no. 9, Sept. 1943, pp. 347–351. Review of developments with special reference to ferric sulfate or "Ferrisul"; advantages of ferric coagulation; removal of manganese; coagulation during cold weather; sewage treatment; silica removal in boiler-feedwater treatment. Bibliography.

Westfield, N.Y. Standard Rate Filter Operation Experiences at Westfield, N.Y., J. T. Howson. *Sewage Work J.*, vol. 115, no. 5, Sept. 1943, pp. 817–823, (discussion) 823–827. Description of new plant, equipment, capacity; filter-operation problems, including clogging of nozzles by leaves, filter flies, ponding, stopping of rotation of distributor accompanied by grating noises in pedestal bearings, and bad odors from filter underdrain collection trough. Before N.Y. State Sewage Works Assn.

STRUCTURAL ENGINEERING

Research Laboratories, Design. Earth-Filled Walls for X-Ray Building. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 636–637. Research building recently completed at Ohio State University to house 20 million v betatron and 3 million v electro-static generator has thick earth-filled concrete block walls around X-ray equipment, instead of more normal sheet-lead protection.

Structural Design. Tapered and Stepped Columns Designed for Minimum Weight, A. H. Church. *Product Eng.*, vol. 14, no. 8, Aug. 1943, pp. 499–502. Analysis of distribution of stress indicates weight-saving possibilities inherent in long columns having varying cross section; as guide for design, hinged-end columns with different types and proportions of taper are compared and summarized on weight basis; method is also developed for designing and calculating proportions of constant strength columns.

TUNNELS

Railroad, Virginia. Blue Ridge Tunnel, A. W. Loomis. *Compressed Air Mag.*, vol. 48, no. 9, Sept. 1943, pp. 7132–7135. Features of and account of construction work on tunnel of Chesapeake and Ohio Railroad, described in paper previously indexed from *Eng. News-Rec.*, July 1, 1943.

Railroad, Virginia. Deep Cut Replaces Old Railroad Tunnel, A. W. Loomis. *Compressed Air Mag.*, vol. 48, no. 11, Nov. 1943, pp. 7196–7197. Illustrated note on part of reconstruction program of Chesapeake and Ohio Railway Company, on section crossing Blue Ridge Mountains; all tunnels were built between 1850 and 1858; instead of enlarging 538-ft Greenwood Tunnel, it was decided to replace it with a cut about 600 ft long, close to lining of old tunnel; tunnel walls were reinforced; as soon as new cut was completed, steel lining was salvaged.

Vehicular, New York City. Narrows Tunnel Project, New York. *Engineer*, vol. 176, no. 4571, Aug. 20, 1943, pp. 152–153. Review of progress report made by New York City Tunnel Authority disclosing how necessary contemplated structure has become as means of integrating and controlling motor vehicle traffic within metropolis; tunnel will provide for two lanes of vehicular traffic in each direction through two tubes; to be operated as toll project; it is estimated that traffic will be 6 million vehicles, and ultimately increase to 16 million per annum.

Water Supply, Colorado. How a Tunnel Drill Round Is Blasted, M. W. Terrill. *Compressed Air Mag.*, vol. 48, no. 11, Nov. 1943, pp. 7193–7195. Sketches and description of principal drill-round used in 13.06-mile Continental Divide Tunnel, project of U. S. Bureau of Reclamation, for carrying water from western side of divide to eastern side for irrigation and power.

Water Supply, Concrete Lining. Placing Concrete Lining in 19-Ft. Tunnel. *Eng. News-Rec.*, vol. 131, no. 17, Oct. 21, 1943, pp. 604–606. Concrete lining in 28,200-ft Pit River No. 5 hydroelectric tunnel; sequence in placing successive portions of lining and use of high wall pours saved valuable time; steel forms for arch that had been used on another tunnel were rebuilt into self-supporting collapsible type well suited to this job.

Water Supply, Design. Selection of Tunnel Factors, A. E. Niederhoff and A. C. Ross. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 454–456. Charts for determining tunnel diameters, costs per linear foot, and other hydraulic characteristics of hydraulic tubes.

WATER PIPE LINES

Concrete. Experience With Wire-Wound Pre-Stressed Concrete Pressure Pipe in Chicago, W. W. DeBerard and W. B. Weldon. *Am. Water Works Assn.—J.*, vol. 35, no. 10, Oct. 1943, pp. 1263–1280. Complete account of experience, from bids through molding of pipe, curing, wire wrapping, hydraulic test, protective coating, strain test, cutting in connections, inspection, delivery, and laying; appendix containing specifications and regulations.

...and failure gets no second chance!

"Surface!" With that command life itself hangs in the balance . . . depends upon pumps . . . reliable and efficient pumps that dare not fail *once!* It's a critical moment at any time . . . on any submarine, that demands the highest standards of perfection in pumping equipment.

That's why Fairbanks-Morse Pumps are used in United States submarine service. You can rely on Fairbanks-Morse Pumps . . . can know in advance that their mechanical superiority assures you dependable, economical operation now and for years to come.

For consultation without obligation, write Fairbanks, Morse & Co., 275 Fairbanks-Morse Building, Chicago 5, Illinois.

Fairbanks-Morse Centrifugal Pumps

A complete "family" of single-stage, split-case pumps for low, moderate, medium, and high heads, is described in Bulletin 5810D. Many other bulletins available on other types.

FAIRBANKS-MORSE

DIESEL ENGINES WATER SYSTEMS
PUMPS SCALES
MOTORS STOKERS
GENERATORS FARM EQUIPMENT
RAILROAD EQUIPMENT

Pumps

CONCRETE. Good Practice in Laying Concrete Pipe, L. R. Howson. *Am. Water Works Assn.—J.*, vol. 35, no. 10, Oct. 1943, pp. 1258–1262. Description of special procedures, including coordination of manufacture and laying, delivery, trenching, underdrainage and cradles, joints, access manholes, and backing.

CONCRETE. New Method Used to Make Prestressed Concrete Pipe. *Eng. News-Rec.*, vol. 131, no. 13, Sept. 23, 1943, pp. 476–478. Designed to withstand hydraulic pressure of 200 lb per sq in., several hundred feet of wire-wound, prestressed concrete pipe 36 in. in diameter were used in Chicago recently in constructing feeder main to new war plant; pipe was centrifugally cast in 12-ft lengths, several innovations being introduced in its manufacture; pipe was laid at considerable saving in cost over concrete-encased steel shell pipe.

CONSTRUCTION. Trenching and Laying Sewer and Water Pipe. *Pub. Works*, vol. 74, no. 10, Oct. 1943, p. 11, and 15 pp. between pp. 24 and 48. Items to be considered are organization and planning, location, safe methods, accident prevention, proper bedding of pipe, pipe laying and jointing methods, handling pipe, cleaning and testing pipe and completed line, sterilizing water mains, placement of hydrants, valves and manholes, procedures in force account and contract work; factors discussed from practical viewpoint.

WATER PUMPING PLANTS

BOOSTER STATIONS. Booster Station Built in Record Time, L. E. Ayres. *Eng. News-Rec.*, vol. 131, no. 13, Sept. 23, 1943, pp. 472–475. Increased water pressure in northern portions of Detroit metropolitan area was made possible by construction of booster station near eastern edge of Highland Park; by means of new station, existing 40,000,000-gal reservoir owned by city of Highland Park is filled at night from Detroit system and water is pumped back into distribution mains during afternoons and evenings, when water demands are greater.

WATER RESOURCES

DES MOINES, IOWA. Artificial Flooding Builds Up Ground Water Yield, D. L. Maffitt. *Water Works Eng.*, vol. 96, no. 22, Nov. 3, 1943, pp. 1230–1232. Use of natural terrain to provide storage space for its ground-water supply is practice followed at Des Moines, Iowa; water, taken from Raccoon River, is flooded into basins from which it infiltrates through natural soil into collecting galleries; 64-acre flooding area is divided off into several basins by earth levees formed from group scrapings; by this means sufficient water is stored to carry through periods o extremely low river flow.

WATER TREATMENT

CHLORINATION. Control of Chlorinatio *Am. Water Works Assn.—J.*, vol. 35, no. 10, Oct 1943, pp. 1315–1328. Methods recommende by Committee on Control of Chlorination fo determination of chlorine; differentiation betwee chlorine and chloramine, measuring both hig and low residuals in field and laboratory, an determination of chlorine demands under an specified condition. Bibliography.

IRON REMOVAL. Treatment Problems wit Iron and Manganese, S. M. Ellsworth. *Wate Works Eng.*, vol. 96, no. 19, Sept. 22, 1943, pp 1072–1076. Presents results of investigation of typical variations in quality of water in fou different localities and procedures adopted i each case.

OZONE. Ozonation Tests on Philadelphia Water Supply, M. J. McLaughlin. *Wate Works Eng.*, vol. 96, no. 20, Oct. 6, 1943, pp. 1131–1134, 1157–1158. Report of plant installations tests, and results in use of ozone for reducing disagreeable taste-and-odor properties.

TASTE AND ODOR CONTROL. Taste and Odo Control by Reservoir Chlorine Blanket, G. L O'Brien. *Water Works Eng.*, vol. 96, no. 18 Sept. 8, 1943, pp. 996–999, 1050–1051. Bad taste and odors from reservoir, due to 30-year accumulation of bottom sludge, finally removed from water delivered in Baltimore, Md., by heavy chlorination; description of reservoir pipe lines previous experiments with copper sulfate.

WATER SOFTENING, ZEOLITE PROCESS. Softening and Manganese Removal by Zeolites, D. E Davis. *Water Works Eng.*, vol. 96, no. 18, Sept 8, 1943, pp. 1012, 1015–1017. Two treatment plants using green sand after tests proved effectiveness; details of tests and description o plants.

WATER WORKS ENGINEERING

CONSERVATION, PHILADELPHIA. Background of Philadelphia's Present Water Waste Control Program, M. J. McLaughlin. *Pub. Works*, vol 74, no. 10, Oct. 1943, pp. 20–22. Water-waste surveys, stopping of leaks, and installation o meters enabled Philadelphia to save over 20,000,000 gal per day, one-fourth of which was due to leaks from abandoned services.

MILITARY ENGINEERING. American Forces Develop Own Field Water Supply. *Water Works Eng.*, vol. 96, no. 19, Sept. 22, 1943, p. 1087. Brief account of problems of supply in Sicilian invasion, and methods of solution.

NEW JERSEY. Operation of Wanaque, N.J., Supply System, C. H. Capen. *Water Works Eng.*, vol. 96, no. 21, Oct. 20, 1943, pp. 1184–1185, 1202. Some 25 years ago, eight municipalities in northeastern New Jersey, joined in developing water supply of nearly 100 mgd; Wanaque Reservoir, with storage capacity of 29,000 mg, was built; all water is delivered at wholesale; how system operates is explained and some difficulties experienced are noted.

OMAHA, NEBR. Improvements to River Intake at Omaha, Nebraska, J. C. Detweiler and K. H. Larkin. *Water Works Eng.*, vol. 96, no. 21, Oct. 20, 1943, pp. 1186–1190. When improvements on Missouri River deepened channel to increase hydraulic efficiency at low-river stage, it was found necessary to alter existing facilities of river intake at Omaha, Nebr.; this was effected by construction of cell-type cofferdam to provide dry working area, excavating river-bed rock down to necessary level, and underpinning old structure which had been built in 1914.

RACINE, WIS. Practices in Racine, Wis., W. A. Peirce. *Water Works Eng.*, vol. 96, no. 18, Sept. 8, 1943, pp. 1000–1004, 1043–1048. Outline of organization; maintenance and operating practices both in treatment and delivery of water.

SAN DIEGO, CALIF. San Diego Seeks More Water. *Western Construction News*, vol. 18, no. 10, Oct. 1943, pp. 449–450. Problem of supplying water to San Diego's increasing population; only solution to problem seems to be to initiate construction of a Colorado River conduit before local supplies are exhausted.

WATER SUPPLY, AIRPORT. Pumping-Station Construction at Western Air Fields, A. J. Taunton. *Water & Sewage*, vol. 81, no. 9, Sept. 1943, pp. 15–19. Description of installations at airports in western Canada; wells, storage reservoir, pressure tank, fire pump, service pump, and chlorinator discussed.

WATER TANKS AND TOWERS, FREEZING. Water Circulation Prevents Freezing. *Western Construction News*, vol. 18, no. 7, July 1943, p. 305. Description of 150,000-gal elevated water tank at Grand Canyon, Ariz., and water-circulation system.

WATER WELLS. Construction of Wells for Public Water Supplies, H. Grove. *Water & Sewage*, vol. 81, no. 9, Sept. 1943, pp. 25–26, 45–46. Discussion of test holes, location of well, construction; specifications, size, well logs, casing, cement, and grouting.

RECENT WILEY BOOKS for
CIVIL ENGINEERS

YOU'LL find these recent Wiley Books practical, authoritative and up to date. Whether you want a "refresher" or want to increase your knowledge—look over the books on the Wiley list. Select the books you need and mail the coupon now. Keep abreast of new developments in civil engineering. Act today!

MODERN TIMBER DESIGN
By Howard J. Hansen
232 PAGES $3.00
A timely book, especially now with the renewed interest in timber design. All the basic information needed by the designing engineer is given here, with particular stress laid on timber connectors and glued laminated construction.

AIRPLANE STRUCTURES, Third Edition
By Alfred S. Niles and Joseph S. Newell
VOL. I 455 PAGES $4.50
VOL. II 439 PAGES $4.50
For aeronautical designers and structural engineers. Volume I contains data and structural theory necessary for the structural design of airplanes. Volume II covers advanced problems in metal and plywood construction as well as statically indeterminate structures and beam-columns.

PHOTOGRAMMETRY, Third Edition
By H. O. Sharp
157 PAGES $3.50
For civil engineers and surveyors, the fundamental principles of both terrestrial and aerial photographic surveying and their application to map making. Includes chapters on the analytical solution of photogrammetric problems and the use of the most popular photogrammetric instruments.

MATERIALS AND METHODS OF ARCHITECTURAL CONSTRUCTION, Second Edition
By Charles M. Gay and Harry Parker
636 PAGES $6.00
Rewritten to keep abreast of current practices in architectural construction, this book gives the latest uses of pressed wood, plastics and structural glass as well as the newest tables on the strength of materials and properties of structural steel. Also includes floor and roof construction, concrete design, and many other subjects.

GEODETIC CONTROL SURVEYS, Second Edition
By H. O. Sharp
132 PAGES $4.50
For engineers who want a clear concise presentation of survey methods and computations. The book gives both fundamental theory and practical application of the proper use of astronomic coordinates, geodetic coordinates and plane coordinates, together with the computations needed to change from one system to another.

THEORETICAL SOIL MECHANICS
By Karl Terzaghi
510 PAGES $5.00
Here for the first time, tested theories of soil mechanics are completely treated and critically evaluated. The book affords a working knowledge of useful methods of analysis and shows the manifold factors that may influence the behavior of simple, ideal materials. Establishes the theoretical principles of earth pressure, stability and settlement computations.

STREAM FLOW—Measurements, Records and Their Uses
By N. C. Grover and A. W. Harrington
363 PAGES $4.00
Covers instruments, equipment and processes employed in field work related to the collection of systematic records of river discharge. Will help you to prepare stream flow records to report on projects for control, utilization and administration of river water, or to evaluate or adjudicate water rights. A book of real and lasting value.

SIMPLIFIED DESIGN OF REINFORCED CONCRETE
By Harry Parker
249 PAGES $2.75
Contains simple, succinct explanations of all the usual reinforced concrete members in buildings. Includes numerous worked-out examples of design, an abundance of tables, and many typical problems for the reader to solve.

PLUMBING PRACTICE AND DESIGN
By Svend Plum
VOL. I 315 PAGES $4.50
VOL. II 329 PAGES $4.50
A complete working library on plumbing. Volume I contains material on corrosion, materials, pipes and fittings, valves and controls, fixtures, pumps, fire protection, air piping and equipment. Volume II covers physical and chemical terms, codes and regulations, architectural practice, water supply, sewage disposal, gas piping and appliances and many other subjects of interest to the practical engineer.

STRUCTURAL FRAMEWORKS
By Clyde T. Morris and Samuel T. Carpenter
272 PAGES $4.00
An essential book for engineers confronted with complex problems of modern industrial frameworks. The book contains an analysis of problems of the design of rigid frame buildings, industrial plants, radio and transmission towers.

ON APPROVAL COUPON

JOHN WILEY & SONS, INC.
440 Fourth Avenue, New York 16, N. Y.

Please send me on ten days' approval the books I have checked in this advertisement (or I am attaching to this coupon a separate list of the books desired). At the end of that time, if I decide to keep the books, I will remit indicated price plus postage; otherwise I will return the books postpaid.

Name . . . .
Address . . . .
City and State . . . .
Employed by . . . .

CE-2-44

BOY! HAVE I BEEN PLACES!

Tiger Brand has been scarce on the home front . . . for military reasons only

Because we are the world's largest manufacturers of wire rope, it was logical for Uncle Sam to turn to us early for help in supplying the huge tonnages of wire rope needed for the war effort. To date, American Tiger Brand Wire Rope has been used in breath-taking quantities on every front.

As new and unusual service tasks had to be faced, our engineers produced the right wire rope to meet them. Our plants were kept running around the clock. Production facilities were expanded again and again to keep pace with wartime needs.

Now a growing amount of Tiger Brand is becoming available for use here at home. This wire rope incorporates all the improvements that war-stimulated advancement in rope-making technique provides. So, when you need rope—and want the best—get in touch with your Tiger Brand distributor.

Excellay Preformed

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

United States Steel Export Company, New York

AMERICAN TIGER BRAND WIRE ROPE
AMERICAN STEEL & WIRE COMPANY

UNITED STATES STEEL

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, direct from the publisher, or they may be borrowed from the Engineering Societies Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Highway, British Columbia. Kiskatinaw River Crossing, R. P. Agnew and J. B. Kiely. *Western Construction News*, vol. 18, no. 11, Nov. 1943, pp. 496–498. Description of bridge on Alaska Highway built from falsework in severe winter weather; creosote-treated deck trusses prefabricated from 423-ft structure built on 9-deg curve.

Highway, Raising. Bridge Spans Raised by Gantry Crane to Clear New Reservoir Level. *Construction Methods*, vol. 25, no. 11, Nov. 1943, pp. 45, 140, 142. Brief description of methods used to raise truss spans varying amounts up to 16 ft 6 in., and viaduct spans up to 18 ft 6 in.

Plate Girder, Hartford, Conn. Charter Oak Bridge. *Engineer*, vol. 176, no. 4577, Oct. 1, 1943, pp. 261–264. Illustrated description of new high-level crossing; structure consists of four divisions: river crossing 842 ft long, East Hartford viaduct 1,104 ft long, southwest viaduct 1,259 ft long, and northwest viaduct that makes connection with dike road having length of 735 ft; river crossing made up of three plate girder spans.

Railroad, Brazil. Railroad Bridges Reinforced in Brazil. *Eng. News-Rec.*, vol. 131, no. 23, Dec. 2, 1943, pp. 822–823. Old railroad bridges in Brazil were reinforced to carry increased train loadings without interrupting traffic; plate-girder spans were converted into trussed structures; simple trusses were strengthened by superimposing flexible steel arch on top chords; and simple span girders and trusses were made stronger by adding central pier.

Railroad, Maintenance and Repair. Substructure Repairs Under Difficult Underwater Conditions on 70-Year-Old Railway Bridge. *Roads & Bridges*, vol. 81, no. 11, Nov. 1943, pp. 36–40, 65–69. Illustrated description of methods used in repairing substructure of International Bridge operated by Canadian National Railways over Niagara River between Fort Erie, Ontario, and Buffalo, N.Y.; protection for diver; masonry restoration.

Railroad Materials, Conservation. Materials—Still Critical Constantly Changing Problem. *Ry. Eng. & Maintenance*, vol. 39, no. 12, Dec. 1943, pp. 960–966. Symposium of five addresses before Am. Ry. Bridge & Bldg. Assn., discussing many phases of problem, particularly as it affects bridge, building, and water service work: General Situation Still Tense, A. C. Mann; Suggestions from WPB, O. F. Dalstrom; What Building Men Can Do About It, A. L. Sparks; Water Service Men Can Help, E. M. Grime; As Seen by Bridge Man, A. M. Knowles.

Railroad, Stresses. Impact Tests on Railroad Bridge, E. E. R. Tratman. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 899–901. Tests made to determine static and dynamic effects of electric and steam locomotives running over ballasted, concrete-decked girder span at wide range of speeds; impact stresses, determined by electromagnetic strain gages attached to girder flanges, found to be below design requirements of Am. Ry. Eng. Assn. specifications; results show that steel girders and concrete deck slab function as composite beams, depending on proper bond between steel and concrete.

Suspension, British Columbia. Race with Ice Break-up Won as Peace River Suspension Bridge on Alaska Highway Is Built in Record Time. *Construction Methods*, vol. 25, no. 11, Nov. 1943, pp. 60–62, 142, 144, 146. Illustrated description of work on 2,130-ft bridge completed in 7 months under difficult conditions.

Wooden. Building Timber Truss Bridge on Alaska Highway. *Pub. Works*, vol. 74, no. 11, Nov. 1943, pp. 16–18. Timber truss bridge with total length of 584 ft built in 23 weeks, large part of time at subzero temperature, using material trucked 60 to 164 miles; constructional details given.

Wooden, Design. Live Load Reactions to Timber Stringers, J. E. Lothers. *Eng. News-Rec.*, vol. 131, no. 23, Dec. 2, 1943, pp. 811–813. Current design specifications governing distribution of wheel loads to stringers of timber highway bridges carrying laminated timber flooring are questioned as being too conservative; formulas are developed for calculating live-load distribution, based on relative stiffness of load-carrying stringers and superimposed timber flooring; values of wheel-load reactions of stringers of various spacings, computed by proposed formulas, are compared with those recommended by A.A.S.H.O. specifications.

BUILDINGS

Building Materials, Earth. Rammed Earth Building Construction, H. E. Glenn. *Clemson Agric. College of South Carolina—Eng. Experiment Station—Bul. No. 3*, May 1943, 18 pp. Determination of physical properties of red clay of Piedmont section of South Carolina when combined with various mixtures of sand and certain other admixtures; from laboratory experiments, certain mixes of sand and clay and admixture of Portland cement and hydrated lime selected for further experimentation in construction of model structure; selection of material and method of construction in building structure of type described; results discussed.

Warehouses, Military. Emergency Housing in South Pacific, P. B. Parker. *Military Engr.*, vol. 35, no. 216, Oct. 1943, pp. 509–510. Brief description with framing diagram of thatch buildings for housing supplies.

Wooden Construction. Glued-Laminated Lumber Construction, F. J. Hanrahan. *Mech. Eng.*, vol. 65, no. 12, Dec. 1943, pp. 905–913. Recent advances in wood construction have been made possible by timber connectors and glued laminated construction; author shows versatility of structural lumber by illustrations and some details of various types of laminated construction recently developed; advantages and economies cited; limitations of glued construction; cost comparison; design of structural timber; method of fabrication.

CITY AND REGIONAL PLANNING

Airports, Planning. Air Traffic and Airports in Relation to Urban Planning, W. A. M. Burden. *Am. City*, vol. 58, nos. 11 and 12, Nov. 1943, pp. 35–37, Dec., pp. 75, 77, and 79. Effect of airports on urban planning; spacing of airports; one major airport vs. multiple airports; separate airports for freight; access highways and transport; outlying site for airport; separate airports for different kinds of operation; civilian flying facilities; helicopter and air transportation; airports and land use; new communities near airports; recreational areas.

CONCRETE

Barges. Concrete Construction for Ship-shaped Barges. *Pac. Mar. Rev.*, vol. 40, no. 11, Nov. 1943, pp. 62–69. Twenty-six reinforced concrete barges being built by Barrett and Hilp at Belair Island, for U.S. Maritime Commission; hull design; structural details; yard layout; concrete procedure; launching; vessel has overall length of 365 ft, beam 54 ft, depth amidships 35 ft, and loaded displacement of 10,950 long tons on 26-ft 3-in. draft.

Barges. New Type of Concrete-Steel Barge. *Shipbldg. & Shipg. Rec.*, vol. 62, no. 18, Oct. 28. 1943, pp. 420–423. Illustrated description of barge for River Thames; constructional details given; steel required in barges built to this design is approximately one-third of that required for all-steel barge, and total weight of steel and concrete is only slightly greater than that of steel hull.

Construction, Joints. Prevention and Control of Cracking in Reinforced Concrete Buildings, W. S. Merrill. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 893–895. Use of control joints to eliminate cracking in walls and parapets of power plant buildings.

Drydocks. Graving-Dock Construction Under Water. *Engineering*, vol. 156, no. 4048, Aug. 13, 1943, pp. 121–124, (illustrations) 130. Illustrated description of constructional methods employed in building of two large drydocks in Navy Yard in eastern part of United States; two docks, situated side by side, will be used for building large warships.

Mixing, Standards. Proposed Recommended Practice for Design of Concrete Mixes, R. F. Blanks and W. H. Price. *Am. Concrete Inst.—J.*, vol. 15, no. 2, Nov. 1943, pp. 93–114. Recommended procedure for making laboratory mix tests is outlined; selection of water-cement ratio; selection of limiting slump and maximum size of aggregate; estimating percentage of sand and unit water content; computation of trial mix; adjustment of trial mix. Bibliography.

Pipe, Manufacture. Pre-Stressed Concrete Pipe by New Manufacturing Method. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 885–887. Reinforced concrete pipe with steel stressed in tension and concrete stressed in compression has been made for water system extensions by Lock Joint Pipe Co.; pipe is continuous welded steel cylinder with steel joint rings forming bell and spigot ends and with rubber gasket as sealing element; cylinder is centrifugally lined with concrete to thickness of 1⁷/₈ in.

Sand and Gravel Plants, Arkansas. Coordinated Plant Crushes, Screens and Batches Concrete Materials for Norfork Dam. *Construction Methods*, vol. 25, no. 11, Nov. 1943, pp. 78–80, 136, 138, 140. Description of gravel processing, rock production batching system, cement supply for construction of Norfork Dam.

Sewers. Box Sewer in Deep Trench Built for Flood-Control at Hartford. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 888–890. Box sewer being built in 40-ft sections; each monolith constructed in two pours, invert first being built and then sidewalls and top in one pour; interior forms designed to permit re-use; trench sheeting used for exterior forms and left in place.

Spillway Tunnels. Erosion Causes Invert Break in Boulder Dam Spillway Tunnel, K. B. Keener. *Eng. News-Rec.*, vol. 131, no. 21, Nov. 18, 1943, pp. 762–776. Discussion, with illustrations, of cause of break, 112 ft long and 33 ft wide, and repair; backflow of river at tunnel outlet bulkheaded off, scoured area unwatered, trimmed, and cleaned, and concrete backfilling and surfaces carefully finished.

CONSTRUCTION INDUSTRY

Navy Construction Operations. Navy Construction by Bureau of Yards and Docks. *Construction Methods*, vol. 25, no. 11, Nov. 1943, pp. 48–57. Illustrated descriptions of work on lighter-than-air hangars, dry docks, ordnance warehouse, Naval training station and bases, and miscellaneous structures at home and abroad.

DAMS

Cableways, Weirs. Taken for Ride. *Hydro News*, vol. 30, no. 12, Dec. 1943, pp. 8–10, 16. Description of weir, artificial island, and cableway in Niagara River; experiences in riding cableway.

Concrete, Isle of Man. Block Eary Dam, Isle of Man, T. N. C. Bulman. *Water & Water Eng.*, vol. 46, no. 570, Nov. 1943, pp. 461–466. Details of design and construction of dam to impound and conserve water for supply to north of Isle of Man.

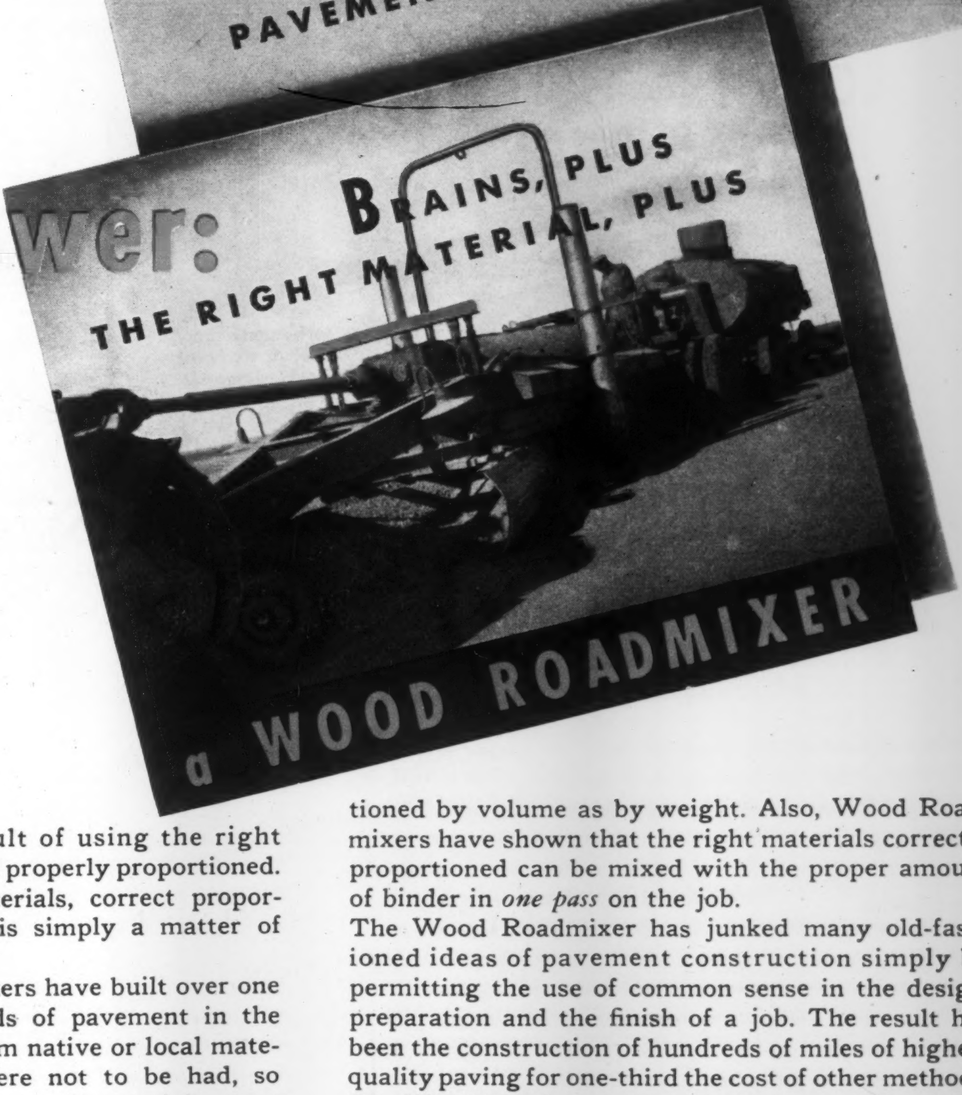
Earth, Colorado. Green Mountain Dam Finished, W. Q. Reeves. *Western Construction News*, vol. 18, no. 12, Dec. 1943, pp. 540–545. Discussion of design and completion of earthfill dam, 309 ft high and 1,100 ft long; reservoir will store water to replace that diverted through Continental Divide tunnel.

Trash Racks. Trash-Rack Design that Prevents Clogging. *Eng. News-Rec.*, vol. 131, no. 25, Dec. 16, 1943, pp. 891–892. Essential feature of improved design is heavy steel bar made of two 15-in. 50-lb channels, which are cut down on

The Problem:

HOW TO GET QUALITY CONSTRUCTION, QUANTITY PRODUCTION AND ECONOMICAL COST IN PAVEMENT CONSTRUCTION

The Answer:



BRAINS, PLUS THE RIGHT MATERIAL, PLUS

a WOOD ROADMIXER

GOOD paving is the result of using the right materials correctly mixed and properly proportioned. What constitutes right materials, correct proportioning and proper mixing is simply a matter of exercising common sense.

For instance, Wood Roadmixers have built over one hundred million square yards of pavement in the United States and abroad from native or local materials. Imported materials were not to be had, so common sense dictated the use of materials at or near the site of the job.

Wood Roadmixers have proved that windrowed materials on the job can be as accurately proportioned by volume as by weight. Also, Wood Roadmixers have shown that the right materials correctly proportioned can be mixed with the proper amount of binder in *one pass* on the job.

The Wood Roadmixer has junked many old-fashioned ideas of pavement construction simply by permitting the use of common sense in the design, preparation and the finish of a job. The result has been the construction of hundreds of miles of highest quality paving for one-third the cost of other methods.

The Wood Roadmixer is a complete traveling mixing plant, and is the pioneer and leading travel plant method of rapid, low cost, high quality pavement construction.

WRITE FOR BULLETIN AND PRICES

DESIGN FOR ROAD-MIX **WOOD ROADMIXER**

Wood Manufacturing Co. • 816 West 5th St., Los Angeles 13, California

one side and then welded together for their full length; placed in row with wider edges upstream, bars make rack in which openings continually widen in downstream direction.

Weirs. Build Submerged Weir in Turbulent Niagara River. *Eng. & Contract. Rec.*, vol. 56, no. 50, Dec. 15, 1943, pp. 10–12. Details pertaining to construction of 1,500-ft submerged weir in Niagara River above Niagara Falls; weir was built from point approximately 400 ft from Canadian shore and extends to within 500 ft of artificial island that was built in center of Niagara River; weir constructed to make more water available for production of power without harming scenic beauty of Falls.

FLOOD CONTROL

Levees, Construction. Flood Control Levee Completed. *Western Construction News*, vol. 18, no. 12, Dec. 1943, pp. 553–554. Details of methods and equipment used in construction of 6 miles of levee near Rio Vista, Calif., involving 4,000,000 cu yd of earthfill.

FOUNDATIONS

Cofferdams. Canvas Lining for Cofferdam Controls Water in Pervious Soil, M. N. Donegian. *Eng. News-Rec.*, vol. 131, no. 21, Nov. 18, 1943, p. 756. Uncontrolled flow of water into cofferdam overcome by placing concrete on waterproof canvas used to form inner lining for sides and bottom of cofferdam, 7 by 30 ft in plan.

Cofferdams. Cofferdams and Caissons, C. E. Fellows. *Civ. Eng.* (London), vol. 38, nos. 447, 448, Sept. 1943, pp. 192–195, Oct., pp. 221–224. Review of general practice concerning principles of subaqueous construction; methods by which subaqueous sites may be approached; exclusion of water from working site; earth and timber dams, cribs, timber and sheet steel pile dams discussed; open caissons and pneumatic caissons considered.

Military Engineering. Pass Dirt, and Then Ammunition, E. G. Vickers. *Excavating Engr.*, vol. 27, no. 9, Sept. 1943, pp. 434–436, 468–469. Dirt-moving operations in construction of naval ammunition depot near Hastings, Nebr.; grading for roads and railroads, excavating for building foundations and cover filling.

Petroleum Refineries. Design of Refinery Footing, J. A. Shjarback. *Western Construction News*, vol. 18, no. 11, Nov. 1943, pp. 508–510. Soil, mass, operating conditions, and seismic forces considered in design of vertical and horizontal vessels used in petroleum refineries.

Steam Power Plants. Power Plant Requires Variety of Foundations, O. S. Bray. *Eng. News-Rec.*, vol. 131, no. 27, Dec. 30, 1943, pp. 966–970. Construction of large power station on low bearing soil dictated use of variety of foundations; open-end pipe piles of 18-in. diameter and 130-ft average length were driven, by sinking 24-in. pipe, about 70 ft long, into which long pile was set, and piles filled with concrete to provide foundation for boiler house, turbine pedestal, and turbine room; other pile types were used, including cast-in-place concrete, composite; wood, and closed-end pipe piles.

HYDROELECTRIC POWER PLANTS

Canada. St. Lawrence River Control and Remedial Dams—Soulanges Section, M. V. Sauer. *Eng. J.*, vol. 26, no. 12, Dec. 1943, pp. 661–670. Description of ways in which hydraulic problems were met, basis on which control structures have been designed, construction features, and operating results.

INLAND WATERWAYS

Canal Locks, Michigan. MacArthur Lock at Soo, J. R. Carr. *Eng. News-Rec.*, vol. 131, no. 21, Nov. 18, 1943, pp. 738–745. Description of lock in St. Mary's River, at Sault Ste. Marie, Mich., which is 800 ft long, 80 ft wide, and overcomes drop of about 22 ft between Lake Superior and Lake Huron; more than 200,000 cu yd of concrete were poured in approach canal walls and lock itself.

Rivers, Improvement. River Re-Alignment Will Increase Effectiveness of Fern Ridge Dam in Oregon, R. Jaren. *Western Construction News*, vol. 18, no. 12, Dec. 1943, pp. 546–50. Background and construction of new channel designed to aid flood-control operation of dam and reservoir; alinement is being straightened and capacity increased from less than 500 cu ft per sec to maximum of 4,800 cu ft per sec.

LAND RECLAMATION AND DRAINAGE

Subways, Drainage. Chicago Subway, Its Drainage and Plumbing. *Domestic Eng.*, vol. 162, no. 5, Nov. 1943, pp. 68–71. Detailed description of drainage system and plumbing installed in new subway; subway is served by 10 permanent pumping stations and one small temporary pump installation; excepting at river crossing, permanent stations are underground structures with pump room floor about 4 ft above base of rail; pumps discharge into overhead city sewers.

MATERIALS TESTING

Concrete. Concerning Concrete, H. C. Ross. *Hydro News*, vol. 30, no. 8, Aug. 1943, pp. 4–8, 21. Studies made by Hydro-Electric Power Commission of Ontario include search for suitable aggregates, laboratory tests and proportioning studies, inspection and control of concrete during construction, periodic examination of existing structures and research; illustrations.

PORTS AND MARITIME STRUCTURES

Breakwaters, Maintenance and Repair. Shore Protection Structures' Maintenance, C. W. Staniford. *Shore & Beach*, vol. 11, no. 2, Oct. 1943, pp. 49, 51. Life of breakwaters, jetties, and other waterfront protective structures could be prolonged by timely repairs; wartime devices built without critical materials; treated materials and rock jetties recommended.

RAILROADS, STATIONS, AND TERMINALS

Railroad Crossings, Signals and Signaling. Crossing Protection on Milwaukee in City of Minneapolis, Minn. *Ry. Signaling*, vol. 36, no. 12, Dec. 1943, pp. 659–660. Signals moved from center to side of street, increasing capacity to handle vehicles, and traffic lights added at some of busy crossings; signals consist of two pairs of back-to-back flashing light lamps, reflectorized rotating stop disk, and standard reflectorized crossbuck railroad crossing sign; they can be operated by manual or automatic control.

ROADS AND STREETS

Access. Colorado Limited Access Road, F. Miller. *Roads & Streets*, vol. 86, no. 10, Oct. 1943, pp. 64–68. Constructional details of 5-mile Denver Ordnance Plant access road; highway consists of two 32-ft main roadways, separated by median strip and flanked by separation curbs and 2-lane local service roads; each main roadway is designed for two 12-ft, traffic lanes and 8-ft outer parking, or emergency, lane; service roads are 22 ft wide.

Airports, Construction. Nevada Airport—$8,000,000 Job Takes Thirty Days. *Western Construction News*, vol. 18, no. 12, Dec. 1943, pp. 535–539. Problems met in construction of concrete apron, runways, water storage reservoir, buildings, sewage disposal system, and water-pipe line.

Bituminous. Hot-Mix "Blanket" with Tapered Edges. *Roads & Streets*, vol. 86, no. 11, Nov. 1943, pp. 49–51. Bituminous blanketing used to preserve failing roads under heavy wartime traffic; procedure used by California Division of Highways is outlined.

Flight Strips. Flight Strip Built with Traveling Plant, H. L. Sligh. *Roads & Streets*, vol. 86, no. 11, Nov. 1943, pp. 52–53. Soil cement flight strip constructed recently under

RECENT WILEY BOOKS for
CIVIL ENGINEERS

Post-war plans are being made now. This, then, is the time to become thoroughly familiar with the latest developments in your field, through study of authoritative books like those listed below. Be ready for new demands. Make your selections and order today through the coupon below.

ENGINEERS' DICTIONARY
Spanish-English and English-Spanish
Compiled by Louis A. Robb
423 Pages Flexible Binding $6.00
A practical, up-to-the-minute dictionary of engineering and construction terms, expressly prepared for Pan-American use. Gives terms in daily use in North, Central and South America.

MODERN TIMBER DESIGN
By Howard J. Hansen
232 Pages $3.00
This book has particular value at this time for the timber designing engineer, because of the renewed interest in this subject. All necessary basic information is included, as well as additional material on timber connectors and glued laminated construction.

PHOTOGRAMMETRY—Third Edition
By H. Oakley Sharp
157 Pages $3.50
For civil engineers and surveyors, the fundamental principles of both terrestrial and aerial photographic surveying and their application to map making.

GEODETIC CONTROL SURVEYS—Second Edition
By H. Oakley Sharp
132 Pages $3.50
For engineers who want a clear concise presentation of survey methods and computations. This book gives both fundamental theory and practical application of the proper use of astronomic coordinates, geodetic coordinates and plane coordinates, together with the computations needed to change from one system to another.

THEORETICAL SOIL MECHANICS
By Karl Terzaghi
510 Pages $5.00
Here for the first time, tested theories of soil mechanics are completely treated and critically evaluated. This book also establishes the theoretical principles of earth pressure, stability and settlement computations.

STREAM FLOW—Measurements, Records and Their Uses
By Nathan C. Grover and Arthur W. Harrington
363 Pages $4.00
Covers instruments, equipment and processes employed in field work related to the collection of systematic records of river discharge. Will help you to prepare stream flow records to report on projects for control, utilization and administration of river water, or to evaluate or adjudicate water rights.

SIMPLIFIED DESIGN OF REINFORCED CONCRETE
By Harry Parker
249 Pages Flexible Binding $2.75
Contains simple, succinct explanations of all the usual reinforced concrete members in buildings. Includes numerous worked-out examples of design, an abundance of tables, and many typical problems for the reader to solve.

PLUMBING PRACTICE AND DESIGN
By Svend Plum
Vol. I 315 Pages $4.50
Vol. II 329 Pages $4.50
A complete working library on plumbing. Volume I contains material on corrosion, materials, pipes and fittings, valves and controls, fixtures, pumps, fire protection, air piping and equipment. Volume II covers physical and chemical terms, codes and regulations, architectural practice, water supply, sewage disposal, gas piping and appliances and many other subjects.

STRUCTURAL FRAMEWORKS
By Clyde T. Morris and Samuel T. Carpenter
272 Pages $4.00
An essential book for engineers confronted with complex problems of modern industrial frameworks. The book contains an analysis of problems in the design of rigid-frame buildings, industrial plants, radio and transmission towers.

ON APPROVAL COUPON

JOHN WILEY & SONS, Inc.
440 Fourth Avenue, New York 16, N. Y.
Please send me on ten days' approval the books I have checked in this advertisement (or I am attaching to this coupon a separate list of the books desired.) At the end of that time, if I decide to keep the books, I will remit indicated price plus postage; otherwise I will return the books postpaid.

Name ....
Address ....
City and State ....
Employed by ....
CE-3-44

Congratulations

ON A FINE JOB, WELL DONE!

THE Treasury "Star" Flag—the bond-buying counterpart of the Army-Navy "E"—marks plants with at least 90% of personnel participating in the Payroll Savings Plan to at least 10% of gross payroll, *and also having reached, or topped, a War Loan Drive quota!*

The successful close of the 4th War Loan Drive finds many more "Star" Flags than ever before flying over the industrial plants of America. To all these, go the heartiest thanks of the nation, and the deep appreciation of the Treasury Department for a great job! And to those who may not quite have qualified for the "Star," go equally sincere thanks—and the confidence that soon they, too, will join the ranks of the "Star" fliers.

One thought that many concerns have found helpful in stepping up the intake from their Payroll Savings Plans is this. In many cases the Treasury Representative in a plant has been able to point out the fact that during *Loan Drive periods* the employees have found it possible to spare much more than they had counted on when setting up their original subscription, and that—*when properly approached*—a very substantial fraction of such employees will decide they can well afford a distinct increase in their current Payroll Savings Plan.

Talk this over with your Treasury Representative—it offers important possibilities when correctly handled. And again accept the Treasury Department's congratulations for your fine work in helping to put over the 4th War Loan.

LET'S **ALL** KEEP
BACKING THE ATTACK
WITH **WAR BONDS**

The Treasury Department acknowledges with appreciation the publication of this message by

CIVIL ENGINEERING

This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council.

FOUNDATIONS FOR POST WAR HANGARS

DRILLED-IN CAISSONS

anchored in Rock Sockets

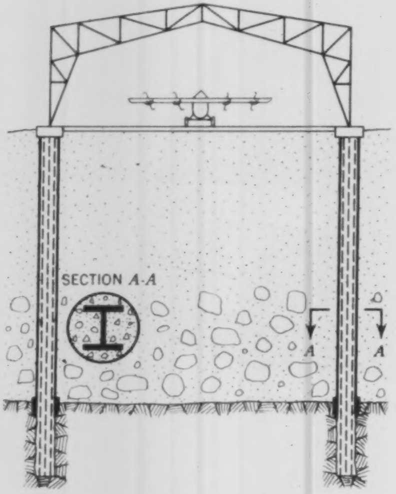
These patented foundations are designed for heavy loads—up to 1500 tons on a single caisson—and can be sunk to great depths through difficult ground.

Send for catalog and reprints descriptive of jobs done.

DRILLED-IN CAISSON CORPORATION

10 East 40th St.
New York 16, N. Y.

52 Vanderbilt Ave.
New York 17, N. Y.



"COMMERCIAL" Improved Tunneling Practice

Post war tunnels

If only half of the information we get is true, there are a lot of tunnels to be driven in the future and smart engineers will inform themselves. The best methods are shown in this booklet.

Write for it. No charge.

The COMMERCIAL SHEARING & STAMPING CO.
YOUNGSTOWN, OHIO

COMMERCIAL
TUNNEL LINERS

FRASER-BRACE ENGINEERING CO., INC.

Design, Construction and installation of complete plants and projects

Mechanical, Heavy Industries, Shipbuilding, Hydro-Electric Developments, Power Plants, Chemical and Refining Plants, Process Industries, Metallurgical Developments and Processes, Explosives, Plastics, Water Supply and Treatment, Sewage and Industrial Wastes Treatment.

REPORTS — APPRAISALS — CONSULTING

10 East 40th Street
New York 16, N. Y.

direction of South Carolina State Highway Dept. and Public Roads Administration, District 14; constructional method; contractors processed or "laid by" from 5,000 to 6,000 sq yd of soil-cement daily in spite of labor and supply difficulties.

FLIGHT STRIPS. "Flight Strips" Program, T. H. MacDonald. *Am. Highways*, vol. 22, no. 4, Oct. 1943, pp. 5–6. Army Air Forces and Public Roads Administration have been developing network of "flight strips" in United States and certain foreign countries, which is of importance not only for current military operations but also for civilian aviation after war; flight markers; location of sites; types of "flight strips"; size of area; needs and use; custodians' building; emergency use; maintenance.

HIGHWAY SYSTEMS, ALASKA. Alaska Military Highway. *Highway Mag.*, vol. 34, Nov.-Dec. 1943, pp. 124–142. Special issue giving illustrated description of various aspects pertaining to Alaska Highway; Second Year of Building Alaska Military Highway, W. H. Spindler; Drainage Problems on Alaska Highway; Men Who Helped Build Alaska Highway; Camp Life; Yukon Trading Posts; Convoy to Alaska; Personal Interest Items and Observations.

HIGHWAY SYSTEMS, ALASKA. Winter-Maintenance Problems on Alaska Highway, G. A. Williams. *Roads & Bridges*, vol. 81, no. 11, Nov. 1943, pp. 27–30, 58–59. Article discusses maintenance problems and manner in which they were overcome; honeycomb ice formation coupled with peculiar stream behavior caused serious traffic difficulties; transportation problem; snow easily handled; keeping equipment functioning; ice a major problem; combating ice; river peculiarities; crossings corduroyed; highway improved.

HIGHWAY SYSTEMS, PLANNING. Highway Planning, W. G. Pruett. *Excavating Engr.*, vol. 37, no. 10, Oct. 1943, pp. 484–487, 506, 508, 510, 514, 516, and 518. Plans for postwar work in state-by-state survey: Alabama, Vermont, Rhode Island, New Hampshire, Ohio, Pennsylvania, Washington, New York, Indiana, Texas, Nebraska, and Illinois.

MAINTENANCE AND REPAIR. Drainage and Embankment of Glenway Avenue at Carson Avenue, Cincinnati, H. H. Kranz. *Pub. Works*, vol. 74, no. 11, Nov. 1943, pp. 11–13, 26. Street fill moved down ravine it crossed because drainage had not been provided and foundation of retaining wall was inadequate; description of remedying these defects.

SNOW AND ICE CONTROL. Skidproofing Icy Surfaces with Abrasives. *Pub. Works*, vol 74, no 12, Dec. 1943, pp. 30, 32. Instructions for using cinders or other abrasives, mixed with calcium chloride; stocking in piles or hoppers; treating airport runways; mechanical spreaders.

SNOW AND ICE CONTROL. Snow-Blowers Extensively Used in Province of Quebec to Keep Open Nearly 5,000 Miles of Road, A. Bergeron. *Roads & Bridges*, vol. 81, no. 10, Oct. 1943, pp. 39, 120, and 122. Commentary on program of snow clearing on main highways; snow fence used extensively; during coming winter department will maintain roads by means of 15 snowblowers and 31 trucks varying in capacity from 3 to 10 tons and equipped with straight or V-plows.

WIDENING. Wartime Paving and Widening Project, P. W. Maetzel. *Pub. Works*, vol. 74, no. 12, Dec. 1943, pp. 11–12. Methods and equipment used in widening of roadway at North Forth Street, Columbus, Ohio; pavement renewed, using old pavement as base; to eliminate use of critical materials, new designs of storm sewer appurtenances were prepared.

SEWERAGE AND SEWAGE DISPOSAL

AERATION. Modified Sewage Aeration, L. R. Setter. *Sewage Works J.*, vol. 15, no. 4, July 1943, pp. 629–641. Study made of three main types: sewage aeration without return of activated sludge or liquor; with continuous return of fourth or last pass aeration tank liquor and with return of "activated" final settling tank sludge to maintain concentration of suspended solids in aeration tank of less than 500 ppm; experimental results; advantages and disadvantages of methods.

DISPOSAL PLANTS, NIAGARA FALLS, N.Y. Sewage Treatment at Niagara Falls, N.Y. *Water & Sewage*, vol. 81, no. 11, Nov. 1943, pp. 32–33. Views of filter wing, grit washer, sludge-storage tank, and flow diagram of sludge and ash through plant.

DISPOSAL PLANTS, WALLA WALLA, WASH. Army and City Collaborate—to Build Air Base Sewage-Treatment Plant in Walla Walla, Wash., E. C. Jensen. *Am. City*, vol. 58, no. 11, Nov. 1943, pp. 42–43, 71. Thoughtful planning by army and municipal officials will make it possible to turn army sewage-treatment plant into permanent municipal improvement, when wartime duties are over; plant combines bio-filtration with significant vacuator for grease and suspended solids removal; manner in which work was accomplished.

GREASE REMOVAL. How New York City Utilizes Sewage Scum, N. I. Kass. *Am. City*, vol. 58, no. 11, Nov. 1943, pp. 56–57. Article explains how grease-laden scum from four of New York City's sewage treatment plants is salvaged; process entails no additional cost and requires no new equipment or added personnel.

EVEN TIGER BRAND NEEDS IT!

Add life to your wire ropes with LUBRICATION

One of the most frequent causes of premature wire rope failure is lack of proper lubrication. Yet lubrication is such a simple means of extending rope life that it seems incredible that rope users should overlook it. But they do.

Every American Tiger Brand Wire Rope comes to you from the factory, properly lubricated and ready for service. But factory lubrication, no matter how efficient, will not last the life of the rope. Field lubrication at regular intervals is absolutely essential. Wire rope is a machine, composed of many working parts. It requires periodic lubrication to reduce frictional wear.

Use a well-tested lubricant like Tiger-Lube which has been developed through years of study and research. Be sure that the rope surface is clean and that the lubricant is applied uniformly and thoroughly.

Lubrication is insurance against corrosion and is the safest way to prevent excessive internal and external rope wear. Lubrication will materially assist in controlling the wear on sheaves and drums and in prolonging rope life, resulting in increased operating efficiency.

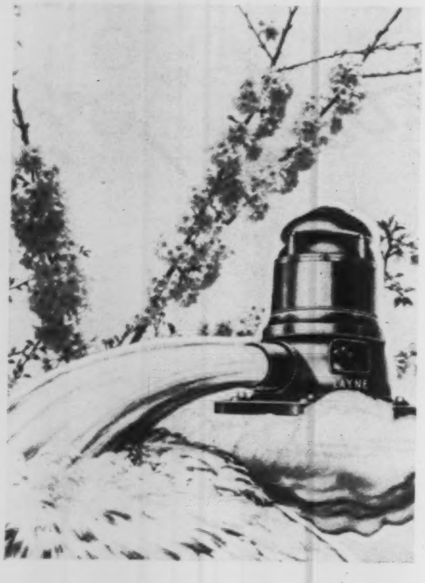
AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
San Francisco
United States Steel Export Company, New York

USS

AMERICAN TIGER BRAND
WIRE ROPE
AMERICAN STEEL & WIRE COMPANY

Excellay Preformed

UNITED STATES STEEL



IT'S ALWAYS

FAIR WEATHER

For a Layne Water System

It's always Fair Weather for America's most skilfully designed, sturdily built and thoroughly proven Water Supply System. Sixty-two years of world-wide leadership in well and pump construction are today paying extra dividends in outstanding performance.

Layne, as a pioneer in water development service, has encountered—and solved, perhaps a hundred times more problems than was ever faced by their nearest competitor.

For postwar days, many new well water systems will be needed. They must possess three important features: long life construction, high volume production, and economical operation. Layne Water Systems have always been outstanding in those very attributes.

Layne is now offering engineering guidance on postwar Water System construction plans. This service is obtainable without obligation. Now is the time to present your water supply problems. Literature on Layne Wells and Pumps may be obtained by addressing LAYNE & BOWLER, INC., General Offices, Memphis 8, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

LAYNE

WELL WATER SYSTEMS

DEEP WELL PUMPS

BUILDERS OF WELL WATER SYSTEMS FOR INDUSTRIES AND MUNICIPALITIES

Current Periodical Literature

Abstracts of Magazine Articles on Civil Engineering Subjects

Selected items for the current Civil Engineering Group of the Engineerin Index Service, 29 West 39th Street, New York, N.Y. Every article indexe is on file and may be borrowed from The Engineering Societies Library Photoprints will be supplied at the cost of reproduction, 25 cents per page t members of the Founder Societies (30 cents to all others), plus postage.

BRIDGES

AIRPORT RUNWAYS. Floatable Bridge Is Airplane Taxiway. *Eng. News-Rec.*, vol. 132, no. 2, Jan. 13, 1944, pp. 47–48. To provide thoroughfare for airplanes across navigable waterway, bridge with deck area of 85 by 110 ft was built; structure designed to be floated away to leave unobstructed channel; buoyancy of twelve steel cylinders is controlled by compressed air.

CONCRETE. Design and Construction Methods Feature Long Concrete Trestle. *Ry. Age*, vol. 116, no. 4, Jan. 22, 1944, pp. 236–240. Soon to be put into service, structure will carry single-track line across potential overflow area in flood control project; it is built in two sections—18,751 ft and 312 ft; thorough studies preceded actual construction, to insure permanence, adaptability, minimum maintenance, and overall economy of trestle.

CONCRETE ARCH, DESIGN. Design of Arch Abutments, W. S. Wilson. *Surveyor*, vol. 102, no. 2703, Nov. 12, 1943, pp. 471–473. Considerable percentage of road bridges consist of concrete slab arches having spans in neighborhood of 50 ft; generally, arches having low rise require more massive abutments than arches of higher rise, since more weight is required to deflect resultant thrust; examples given deal with arch of 50-ft span which has resultant thrust of 13.5 tons per ft at springings, and suitable abutments are indicated for varying ground pressures.

CONCRETE GIRDER. Concrete Bridge Girders Reinforced with Old Steel, N. C. Raab. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, p. 193. Pair of steel girders, 110 ft long and 9 ft 3 in. deep, had been cut in two longitudinally, to facilitate dismantling, making four sections; despite rating as "scrap," girders were used as reinforcing for concrete beams of highway bridge having central span of 80 ft and two cantilever arm approaches of 15 ft each.

CONCRETE, RAISING. Long Concrete and Steel Bridge Raised 10 Feet With Gantry and Jacks, C. D. Haxby. *Roads & Streets*, vol. 86, no. 12, Dec. 1943, pp. 41–44. Description of methods used in lifting 200-ton deck slabs and four continuous truss spans to clear backwater of TVA dam; illustrations given.

DESIGN. Three Span Bridges, N. A. Dews. *Roads & Road Construction*, vol. 21, no. 251, Nov. 1, 1943, pp. 311–314. Formulas and calculations given for design of three-span highway bridge where terrain necessitates structure three or four times length of actual crossing; table gives data on moment of inertia for three-span continuous beam; values from table are sufficient to construct moment envelope from which correct disposition of reinforcement in bending is obtained.

HIGHWAY, DESIGN. Some Considerations Affecting Minimum Depth of Small Highway Bridge Girders, J. F. Pain and T. J. Upstone. *Surveyor*, vol. 102, no. 2700, Oct. 22, 1943, p. 433, (discussion) 433–434. Most of steel highway bridges in Great Britain are of multiple-girder deck type with single, simply supported spans of less than 100 ft, and bridges of that type are considered with respect to some of factors involved in attempting to arrive at rational basis for determining minimum depth possible; specified rules for depth and deflection; effect of deflection and transverse bracing; economic considerations. Before Instn. Civ. Engrs.

HIGHWAY, LOS ANGELES. Spectacular Steel Erection Job on Arroyo Seco Extension Bridge, P. R. Watson. *Calif. Highways & Pub. Works*, vol. 21, nos. 11 and 12, November-December 1943, pp. 4–5, 20. Los Angeles River bridge now under construction consists of five continuous reinforced concrete spans and three continuous steel-plate girder spans on reinforced concrete abutments and piers; construction details given.

HIGHWAY, MAINTENANCE AND REPAIR. Highway Bridge Repaired Under Traffic. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, p. 135. Methods of repair used by Arkansas State Highway Dept. on two-span, through-truss, all-riveted bridge constructed in 1926 over Fourche Creek on Route 65 at south edge of city of Little Rock.

HIGHWAY, ST. LOUIS, MO. Floods Complicate Mississippi Bridge Job, J. N. Newell. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 184–186. Difficulties encountered in erection of large highway bridge over Mississippi River at St. Louis during one of worst floods on recor method employed in construction of erectio bent on site of previously collapsed steel she cofferdam.

MILITARY. Jungle Stream Crossing Expedi ents, M. C. Ellison. *Military Engr.*, vol. 36, n 219, Jan. 1944, pp. 18–19. Illustrated descrip tion of types of bridges improvised by enginee soldier for getting men and supplies over de gorges and streams in jungle terrain.

RAILROAD, STRESSES. Report of Special Com mittee on Impact. *Am. Ry. Eng. Assn.—Bul* vol. 45, no. 443, Jan. 1944, pp. 183–184. Tes of short steel spans with open floor, together wit effect of track inequalities and worn wheels o such spans; tests of steel spans with ballaste deck; tests of dynamic shear in steel girder an truss spans; tests of impact in columns an hangers of steel spans; analysis of additional dat from impact tests.

STEEL ARCH, MAINTENANCE AND REPAI Bombed Viaduct Repairs at Brighton. *Ry. Ga* vol. 80, no. 1, Jan. 7, 1944, pp. 17–18, 22. T arches and pier of 70-ft-high London Road Vi duct were first replaced by steel trestles an spans and then speedily rebuilt under hea traffic; manner in which work was accomplishe

STEEL, RECONSTRUCTION. Rail Bridge Tru Set in 6 Hours. *Western Construction Ne* vol. 19, no. 1, Jan. 1944, pp. 75–77. Six hou required to remove temporary timber railro trestle and replace it with 60-ft steel deck girde no interruptions to traffic on main line of Weste Pacific Railroad.

STEEL, WRECKING. Tank Destroyer Pione Demolition, D. G. Merritt. *Military Eng* vol. 30, no. 219, Jan. 1944, p. 21. 230-ft ste truss bridge at Camp Hood, Tex., was subjecte to 12 charges, totaling 36 lb of TNT; 90% steel was salvageable.

SUSPENSION, BRITISH COLUMBIA. Constru tion Record Set on Alcan Suspension Bridge, Birdsall. *Eng. News-Rec.*, vol. 132, no. 2, Ja 13, 1944, pp. 26–31. Procedure followed in co struction of Peace River Bridge of 930-ft spa principal dimensions shown on schematic dra ing; cable erection procedure.

SUSPENSION, BRITISH COLUMBIA. Peace Riv Suspension Bridge One of Year's Biggest Jo *Eng. & Contract. Rec.*, vol. 56, no. 52, Dec. 1943, pp. 78–79, 108, 110–112, 114. Artic deals with difficulties encountered in buildi steel suspension bridge over Peace River.

VIADUCTS, REPAIR. Repair of Bomb Dama to Railway Viaduct. *Engineer*, vol. 176, 4588, Dec. 17, 1943, pp. 484–485. Illustrat description of repair of London Road viadu at Brighton which carries double track of Sout ern Railway line between Brighton and Lew heavy bomb struck one of piers and caused collapse, together with that of two arches re ing thereon; from date of bombing until fi completion of work was just over 4 months.

WOODEN, MAINTENANCE AND REPAIR. N Hampshire Timber Bridges Rebuilt, H. E. La ley. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 1944, pp. 138–139. Brief, illustrated descri tion of repair operations on Pemigewasset Riv Bridge, which had been wracked out of origi shape, its arches showing both lateral and verti deformation; falsework built; superstruct jacked up.

CIVIL ENGINEERING

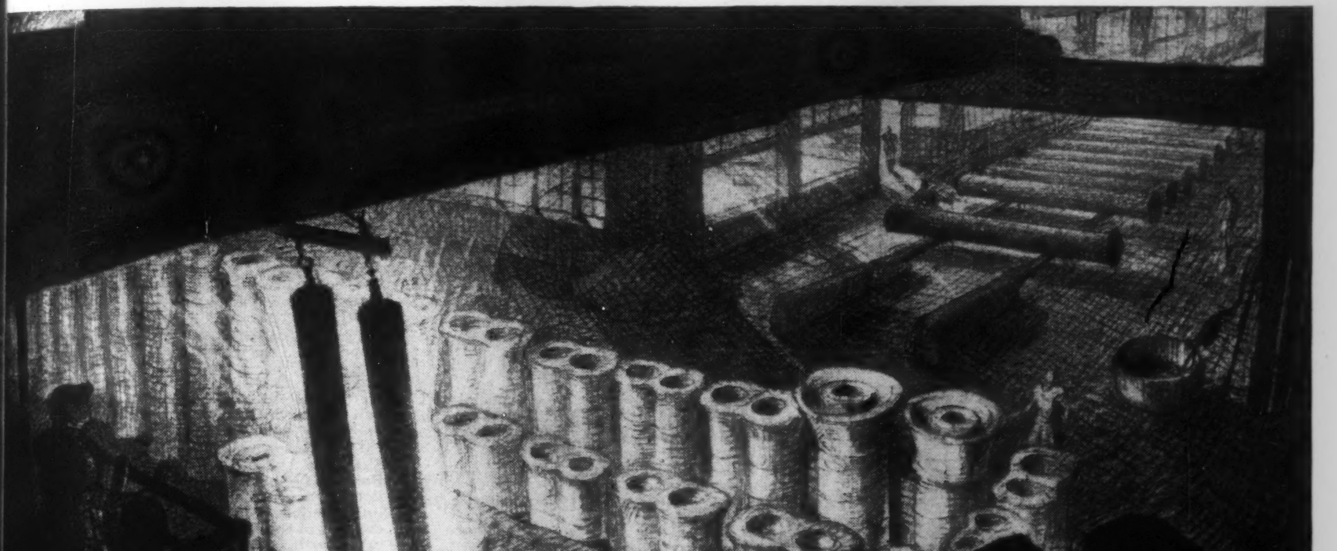
TRACTORS, POSTWAR USE. Postwar Applic tion of Tractor Equipment, T. R. Pauls *Excavating Engr.*, vol. 38, no. 1, Jan. 1944, pp. 1 19, 38, 40–42. Possibilities for development design and use of equipment, such as bulldoze graders, scrapers, tamping rollers, and rippers digging, loading, and transporting excavat materials; basement excavation, land cleari pioneer roads, air fields, and mining cited probable applications.

CITY AND REGIONAL PLANNING

AUSTRALIA. Regional Planning, C. M. Lo field and A. Lang. *Instn. Engrs., Australia—* vol. 15, no. 8, Aug. 1943, pp. 173–188. Co prehensive analysis of problems and needs th face regional planning agencies in Australi fundamental requirements of planning organi tion are given and outline plan for such organi tion is discussed.

Pipe a la carte

The casting pit shown below is used to make various types of pit-cast pipe—bell-and-spigot, mechanical joint, flexible joint, flanged, or with plain ends. This pipe can be made in accordance with American Standards Association, American Water Works Association, American Gas Association, Federal, or special engineers' specifications. Super-deLavaud centrifugally cast iron pipe is also manufactured at several of our plants in sizes 3-inch to 24-inch with bell-and-spigot and mechanical joints or with plain ends. But whatever your need or purpose, if it's cast iron pipe you want, we make it—large or small, lined or unlined, pit-cast or centrifugally cast. We have ample stocks of pipe and standard fittings for immediate shipment and can produce special requirements promptly.



Drawing core bars in one of our pit cast foundries, drawn by Hugh Ferriss

United States Pipe & Foundry Co.

General Offices: Burlington, New Jersey. *Plants and Sales Offices throughout the U. S. A.*

Any Way You Look at it . . .
TOOTH ENOUGH FOR PENCIL!
SMOOTH ENOUGH FOR PEN!

. . . Arkwright's Tracing Cloths are Tops!

Take Arkwright's MATSURF Pencil Tracing Cloth for example. One draftsman will tell you he likes it because it will take pen or pencil lines with equal facility . . . because it erases so neatly. Another will say—because it makes such sharp, legible reproductions . . . stands up under rough handling. Try MATSURF yourself. You'll see that it is superior on all counts. Arkwright Finishing Company, Providence, Rhode Island.

Arkwright TRACING CLOTH
Prudence TRACING CLOTH
Matsurf PENCIL TRACING CLOTH
Arkwright PENCIL CLOTH WHITE

Arkwright TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS

DRAINAGE. Preservation of Watercourses in Town Planning, W. H. Elgar. *Surveyor*, vol. 102, no. 2701, Oct. 29, 1943, p. 451. Author stresses need for greater attention to proper land drainage in future planning; complete survey of all rivers, streams, and ditches should form part of every town planning survey; such features should be recorded upon map with information as to their size, etc. Before Instn. Mun. & County Engrs.

PLANNING PROJECTS. Planning City Construction Projects, S. W. Hodgin. *Purdue Univ.—Eng. Bul.—Extension Series No. 55*, vol. 27, no. 2, Mar. 1943, pp. 149–153. Procedure that should be followed in development of city projects; first is long-time planning to take care of future growth of city and also revamping of existing facilities to meet changed conditions; second is selecting and working out of details of projects which should be undertaken at any particular time; third is that of programming various steps to be followed in construction after work has actually started.

CONCRETE

AUDITORIUMS. Three-Hinged Concret Arch Ribs Precast in Flat Position. *Construction Methods*, vol. 26, no. 1, Jan. 1944, pp. 70–71, 140. Brief account of method used in construction of auditorium gymnasium at naval air station; use of reinforced concrete in arch ribs reduced demand for laminated timber arches; haunch hinges dispensed entirely with steel fittings.

CEMENT PLANTS, CALIFORNIA. World's Largest Cement Plants, R. F. Sweet. *Excavating Engr.*, vol. 38, no. 12, Dec. 1943, pp. 588–592, 628. Description of materials-handling operations at Permanente Cement Company, Calif.; excavation, hauling units, extensive conveying systems.

CONSTRUCTION. "Colloidal" Concrete. *Concrete & Constr. Eng.*, vol. 38, no. 11, Nov. 1943, pp. 360–361. Brief description of processes, equipment, and advantages of new method of making and placing portland cement concrete for use on roads, floors, and other slabs of any normal thickness laid on ground; process is based on increased fluidity of cement-sand mortar resulting from mixing cement and water in colloidal mill.

CONSTRUCTION, JOINTS. Construction Joint Clean-Up Method at Shasta Dam, C. S. Rippon. *Am. Concrete Inst.—J.*, vol. 15, no. 4, Feb. 1944, pp. 293–303. New method for treatment of horizontal construction joints required 2-in. covering of moist sand spread on concrete as soon as surface had hardened sufficiently to withstand necessary traffic; clean-up before placement of next concrete lift consisted of removing wet sand, and washing with high velocity air-water jets; method was abandoned after 9-month operation and, since then, all joints have been cured with water sprays and wet sand blasted just prior to placement of next concrete lift.

CONSTRUCTION, MAINTENANCE AND REPAIR. Repairs to Concrete Structures, L. Davis. *West Virginia Univ.—Eng. Experiment Station—Tech. Bul. No. 23*, 1943, pp. 67–71. Discussion of method of determining cause of disintegration, defects in concrete structures, and feasibility of making repairs.

CONSTRUCTION, FORMS. Light, Flexible, Sheets of Absorptive Lining Stapled to Panel Forms at Norfork Dam. *Construction Methods*, vol. 26, no. 1, Jan. 1944, pp. 66–68. Absorptive lining required for all exposed concrete surfaces, consists of thin sheet of material resembling tough cardboard, faced with cotton fabric cemented to porous fiber backing; when panel forms are stripped from faces of dam, lining adheres to concrete but can be readily removed while lining remains wet.

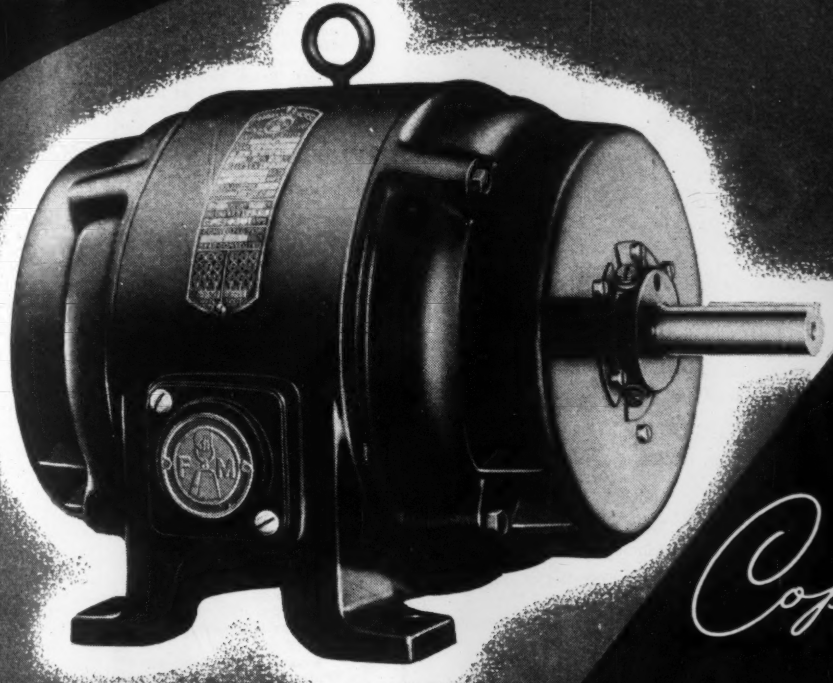
CONSTRUCTION, WIRE STRESSING. Merry-Go-Round Machine Applies High Tensile Steel Wire to Prestressed Concrete Tanks. *Construction Methods*, vol. 26, no. 1, Jan. 1944, pp. 60–61, 132–134. Coil of wire mounted on wire-stressing machine is unreeled as machine travels around tank applying continuous spiral; resistanced mechanism imparts accurately controlled tension to stressed wire; tie cables to center pin in dome roof hold supporting carriage on circular path.

DRYDOCKS. Concrete Problems in Construction of Graving Docks by Tremie Method, W. M. Angas, E. M. Shanley, and J. A. Erickson. *Am. Concrete Inst.—J.*, vol. 15, no. 4, Feb. 1944, pp. 249–279. Advantages of tremie method, and unrivalled speed that method affords in construction of large concrete drydocks; detailed description of numerous unusual problems in mixing, transporting, and placing 450,000 cu yd of concrete that arose when central mixing plant, concrete pumps, and tremie pipes were employed for large underwater construction.

EXPERIMENTAL. Cement Grout for Resurfacing Bituminous Pavements. *Indian Concrete J.*, vol. 17, no. 8, Aug. 1943, p. 245. Work by Queensland Main Roads Commission, in Australia, in 1940 and 1941; section of about 3^{2}/ miles on Capalaba Road in Brisbane City area was cement grout sealed in August and September 1941; pavement is 20 ft wide and was a bitumen drag surface; now raw and harsh but still firm; cost was 4.4 pence per sq yd.

EXPERIMENTAL. Thin Concrete Slabs. *Indian Concrete J.*, vol. 17, no. 7, July 1943, pp.

A Challenge to the Future ... in Motor Design



Copperspun

ROTOR

Here is the new Fairbanks-Morse general purpose, continuous duty motor—designed for the future—available now! Never have more stamina, versatility and protection been built into a motor housing!

BUY WAR BONDS

NOTE THESE FEATURES

- **It is a 40°C. motor.**
- **It is a protected motor.**
- **It has an optional conduit box assembly.**
- **It has cross-flow ventilation.**
- **It has ball bearings—sealed in cartridge type closures.**
- **It has exclusive Fairbanks-Morse *COPPERSPUN ROTOR.***

Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Motors

No laboratory ever exposed wood to more severe test conditions

BANANA ripening rooms are held at temperatures between 56° and 70° F. Humidities are about 95%. Ideal conditions for rapid growth of wood-destroying fungi, but Wolmanized Lumber* is no ordinary wood. It stands up here.

VACUUM PRESSURE impregnation with Wolman Salts* preservative accounts for this unusual ability. Ordinary wood is thus made highly resistant to decay and termite attack—a fact proved by many similar installations of Wolmanized Lumber, in service for many years, in banana ripening rooms.

THIS WOOD ADDS its insulating value to that of the cork-lined walls, while serving primarily as a strong framework for the structures. Wolmanized Lumber is clean, odorless and paintable. Its use introduces no unusual problems; it is light in weight, easy to handle and erect.

SERVICE RECORDS on many other types of installations, covering millions of feet of Wolmanized Lumber, provide equal evidence of its lasting ability. Plan on profiting by the use of this long-lived wood by specifying it for your postwar construction. American Lumber & Treating Company, 1654 McCormick Building, Chicago 4, Illinois.

*Registered trade marks

WOOD THAT'S *Alloyed* FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

223–224. Notes on work done by Queensland Main Roads Commission at Ferndale, on Brisbane Valley Highway, in Australia; foundations on which slabs were cast, consisted of old, hard, gravel road, which had been under traffic for number of years; plans provided for a 3-in. reinforced concrete slab pavement 16 ft wide with special central longitudinal joint; work covered 1,000 ft of road, comprising 880 ft of 10-ft slabs and 120 ft of slabs 40 ft long; cost data; results are generally satisfactory.

HYDRAULIC GATES. Reinforced Concrete Sluice Gates. *Concrete & Constructional Eng.*, vol. 39, no. 1, Jan. 1944, p. 20. Description of gates 4 ft $7^{1}/_{2}$ in. high, 2 ft $11^{1}/_{4}$ in. wide, and $2^{1}/_{4}$ in. thick, reinforced with No. 5 gage twisted rods spaced at 2-in. centers horizontally and at variable spacings in other direction, used in reconstruction of old weir.

LINING WATER TANKS AND TOWERS. Static Water Tanks by Guniting Process, P. V. Raju. *Indian Concrete J.*, vol. 17, no 4, Apr. 1943, pp. 146–147. Detailed description of one or two tanks constructed by guniting process over course of dry brick lining; over brick lining, gunite ($1:3^{1}/_{2}$) is applied at pressure of 40 lb per sq in. to thickness of 1 in. in two successive layers and $^{1}/_{2}$ in. thick with $^{1}/_{4}$-in. chicken mesh 23/24 gage between two layers; care should be taken not to site this type of tank in places where it will be subjected to upward subsoil water pressure.

RESERVOIRS. Unreinforced Concrete Reservoir Has Groined-Arch Roof Design. *Concrete*, vol. 51, no. 12, Dec. 1943, pp. 4–5. Illustrated notes on construction of 600,000-gal reservoir built as water supply improvement at Springfield, Vt.

RESERVOIRS. Cost of Plain and Reinforced Concrete Reservoirs. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 106–107. Unreinforced concrete water supply reservoirs are about 10% more costly, according to results of survey by U.S. Engineers.

ROADS AND STREETS. Air-Entraining Cement Concrete Proves Scale Resistant, E. F. Young. *Eng. News-Rec.*, vol. 131, no. 27, Dec. 30, 1943, pp. 950–953. Tests show that experimental sections of pavement, installed in Minneapolis using air-entraining portland cement, remain free of scale after 4 years of use.

ROADS AND STREETS. Concret Paving Job Uses Air-Entraining Cement. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 83–85, 153, 154, 156. Details of concrete-paving methods on $3^{1}/_{2}$-mile relocation job in Cleveland, Ohio; portland cement containing small percentage of Vinsol resin to provide air-entraining capacity used in construction of pavement in order to increase concrete durability and resistance to scaling.

ROADS AND STREETS. Narrow Pavements Widened with Stabilized Shoulders, H. C. Jahnke. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 59, 148, and 150. Brief description of operations in gravel and binder soil pits, in preparation of material, and construction of clay gravel shoulders, carried out by Minnesota State Highway Dept.

ROAD MATERIALS. More About Air-Entraining Cement. *Roads & Streets*, vol. 86, no. 12, Dec. 1943, pp. 45–47. Concrete having excellent durability, as measured by its resistance to freezing and thawing and to application of common salt or flake calcium chloride, can be produced with air-entraining portland cements; details of research program carried out to solve scaling problem; suggested specifications and construction procedure for concrete involving this cement.

TANKS. High Stressed Wire in Concrete Tanks, J. M. Crom. *Eng. News-Rec.*, vol. 131, no. 27, Dec. 30, 1943, pp. 947–949. Method for winding commercial grades of wire around concrete tanks at stresses of 150,000 lb per sq in. and more; using high stress overcomes loss of compression caused by shrinkage and plastic flow in concrete.

CONSTRUCTION INDUSTRY

POSTWAR. Increasing Efficiency of Construction Industry. *Eng. & Contract. Rec.*, vol. 57, no. 3, Jan. 19, 1944, pp. 26–28, 31–32. Postwar implications of research and training program for building workers are discussed; suggested adoption of system of coordination of dimensions of building materials and equipment with summary of advantages of such system to manufacturer, architect, builder, and contractor.

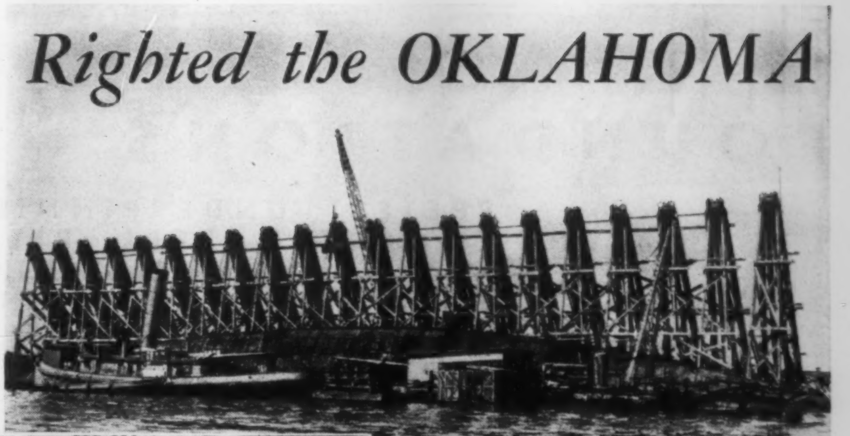
DAMS

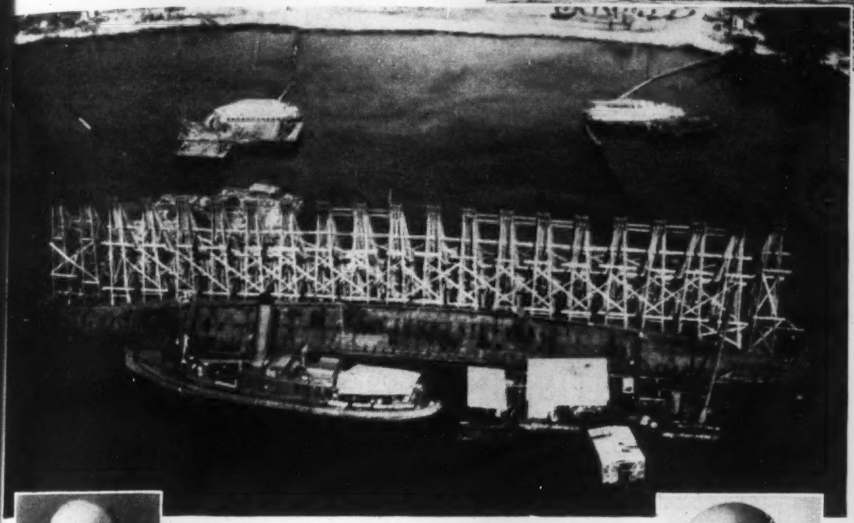
CONCRETE. Small Reinforced Concrete Dam, G. H. Humphreys. *Concrete & Constr. Eng.*, vol. 38, no. 12, Dec. 1943, pp. 367–377. Design of dam used to impound water for use in factory in tropic region where rainfall of 12 in. in 24 hours might be expected; design data; design of spillway; foundation pressure; design of foundation slab; shear stress; anchorages, illustrations, and drawings given.

CONCRETE GRAVITY, ARKANSAS. Norfork Dam Construction Expedited to Provide Power. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 187–192. Concrete is transported from mixing plant to final location in structure by means of cableways supplemented by truck haul; large saving is resulting from addition of limestone dust to mass concrete to improve its workability;

The RIG that Righted the OKLAHOMA

The story of the righting of the *Oklahoma*—a major engineering achievement by the Pacific Bridge Company, with an "assist" from G-E equipment and G-E application engineering





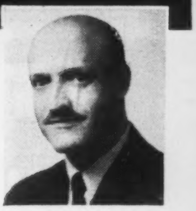
BY

R. F. EMERSON

Industrial Engineering Division, Schenectady, N. Y.

CHARLES STOECKLY

Industrial Division, San Francisco Office



Archimedes Did It First

The year was 285 B.C. A war galley of the King of Syracuse was capsized in the mud. Archimedes, called to the task of righting it, applied the principle of the "compound pulley"—and the muscles of sweating slaves—and succeeded in restoring the 200-ton vessel to service.

The *Oklahoma*—30,000 tons—responded to the same treatment by the men of Pacific Bridge. Sweat? Plenty! But—this time—the "slaves" were motors, and they responded to the commands of their master more faithfully, bent to their task more willingly, than did the serfs of Syracuse.

Versatile Winch Drives Do It Better

Twenty-one G-E variable-voltage motor equipments were chosen to drive 21 winches. These winches, spaced 17 feet apart, were each designed for a line pull of 72,000 pounds at one foot per minute. Each line was reeved through a 17-part "compound pulley," yielding a pull on the ship of more than 600 tons per winch—an aggregate of nearly 13,000 tons for the 21 winches.

The moving blocks of the 21 compound pulleys were attached to the tops of 21 A-frames erected along the bilge keel of the ship to provide the necessary turning moment, and the A-frames were backstayed by lines attached to the side of the hull.

The Real Problem

It was imperative that the winch motors be capable of the most precise individual control. It was not possible to predict the reaction of the huge vessel when it started rolling on a bottom which varied along the ship's length—from semiliquid muck to solid reef coral. Possibilities existed for rocking fore and aft, differential rolling and sliding, and changes in the center of rotation. (All these were encountered.) Furthermore, the forces involved in the righting were so great that failure to control them might well complete the job the Japs began—by breaking the ship apart! Only a control system capable of responding fully to the judgment of the men in charge of the work would serve this job.

Given an understanding of the true problem, such a system was not too difficult to devise, but to build and supply the equipment on short notice was a task of some magnitude. D-c machinery—then, as now, a critically scarce commodity—had to be rounded up swiftly, and its characteristics altered as necessary to fit the job; control equipment had to be built from parts that were obtainable; the system had to be assembled, tested, and shipped. The doing of this required the ingenuity and the co-operation of men in G-E engineering offices, warehouses, and factories from San Francisco to Schenectady.

We at General Electric are proud to have helped with this tremendous task—and glad that the *Oklahoma* floats to fight again.

This project illustrates the kind of assistance General Electric engineers can render to solve problems and promote progress in the construction industry. If you have a problem, their skill plus G-E equipment might well provide the best solution. Just get in touch with our nearest office. We'll be glad to help you. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

BUY WAR BONDS

655-35-8498

FOUNDATIONS

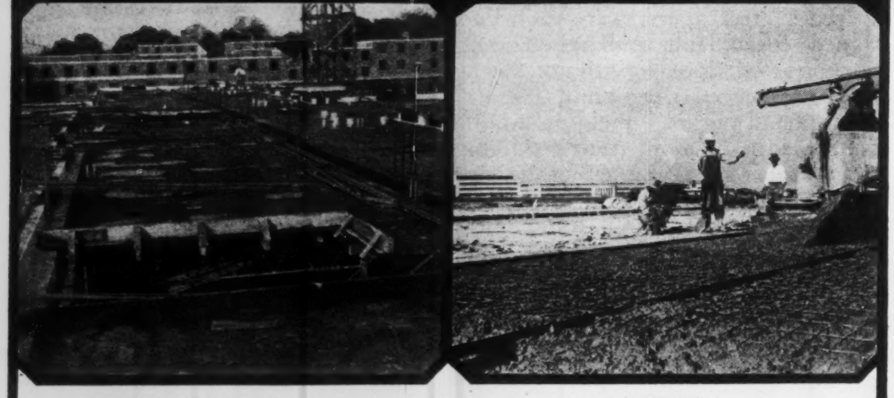
PRETEST UNDERPINNING
CONCRETE-STEEL PILES
MASS CONCRETE CONSTRUCTION
HEAVY SHORING
DRILLED-IN CAISSONS

DRILLED-IN CAISSONS
FOUNDATIONS

Send for catalogs descriptive of the latest foundation types and methods.

SPENCER, WHITE & PRENTIS, INC.
10 EAST 40th ST. NEW YORK 16, N. Y.

LACLEDE STEEL
FOR
BUILDINGS • HIGHWAYS



- REINFORCING BARS
- SPIRALS
- WELDED STIRRUPS
- STEEL JOIST
- PIPE AND CONDUIT
- ACCESSORIES

LACLEDE
Write for Catalog

- WIRE MESH
- CENTER JOINT
- DOWEL SPACERS
- DOWEL BAR ASSEMBLIES
- PIPE REINFORCEMENT
- ACCESSORIES

FOR IMMEDIATE CONSTRUCTION ON APPROVED PROJECTS OR POST WAR PLANNING

LACLEDE STEEL COMPANY
GENERAL OFFICES ARCADE BUILDING ST. LOUIS, MISSOURI

aggregates are supplied by plant of 500-ton hou capacity designed for minimum of waste; da is plain gravity-type structure with 2,624- crest length and maximum height of 233 ft; it w provide ultimate power capacity of four 35,00 kw units.

CONCRETE GRAVITY, OREGON. Wrecked Or gon Dam Rebuilt, H. I. Taylor. *Western Co struction News*, vol. 19, no. 1, Jan. 1944, pp. 72-7 Old timber crib structure along horseshoe-shape crest of Willamette Falls at Oregon City fail in flood and has been replaced by gravity-secti overflow-type concrete dam built behind coffe dam during flood.

CONSTRUCTION, SMALL. Suggestions for Co struction of Small Dams. *Indian Concrete J* vol. 17, no. 5, May 1943, pp. 155–159. Selectio of type; foundations; concrete gravity; masonr gravity; rock-fill; earth-fill; suggestions f concrete work; protection of concrete. Credit given to "Constructional Review" and to in formation sheet published by Portland Cemen Assn. of America.

CONVEYORS, BELT. Nine Conveyor Belt Haul Clay from Anderson Ranch Dam. *Co struction Methods*, vol. 26, no. 1, Jan. 1944, pp 54–55, 130. Conveyor belts 36 in. wide ha impervious clay from borrow pit 1½ miles away other belts 60 in. wide used to haul perviou material for exteriors of dam from another borro pit; part of electricity needed for dam's construc tion is generated by belts, and generators als act as brakes to prevent too rapid speeds.

EARTH, DESIGN. Earth Dams—Their Desig and Causes of Some Failures, M. G. Speedie *Instn. Engrs. Australia—J.*, vol. 15, nos. 9-10 Sept.–Oct. 1943, pp. 205–212. Procedure t adopt in preparing designs for earthen dams i set out, together with some discussion on variou aspects of work; results of analyses of some representative failures are also given as illustratio of difficulties involved and consequences of in correct decisions. Bibliography.

EARTH, PENNSYLVANIA. Construction o Youghiogheny Dam, W. Bauknight and G. P Fleetwood. *Military Engr.*, vol. 36, no. 219 Jan. 1944, pp. 22–23. Dam is located on th Youghiogheny River, a tributary of Monongahela, just above the town of Confluence, Pa. consists of rolled-fill structure, 184 ft in height a stream bed; overall length is 1,600 ft at crest features of rock-crushing plant.

RESERVOIRS, SILT. Debris Problem in Floo Control, P. Baumann. *Eng. News-Rec.*, vol. 132 no. 2, Jan. 13, 1944, pp. 40–43. Conclusions given are based on Los Angeles County experienc with rates of debris accumulation in flood-contro reservoirs and with sluicing or other methods o controlling or removing it; data given cover long-term operation of reservoirs on streams with stee regimen, in which floating, suspended, and dragged debris are all present in quantity; debri removal costs trend toward 1 cent per cu yd.

WEIRS. Build Submerged Weir to Increas Niagara Power. *Elec. News*, vol. 52, no. 24 Dec. 15, 1943, pp. 32–34. Construction of 1,500- ft weir in Niagara River above Niagara Falls has been carried out to make more water available for production of power without harming scenic beauty of falls; description of way engineers surmounted problem of placing massive rocks forming weir in proper place in Niagara River; it was necessary to build artificial island.

FLOOD CONTROL

CALIFORNIA. Rubio Flood Works Complete, P. F. Oppenheimer. *Western Construction News*, vol. 19, no. 1, Jan. 1944, pp. 81–82. Description of project consisting of earthfill debris dam, concrete spillway, and inlet and outlet channels.

FLOW OF FLUIDS

PIPE. Simplification of Hydraulic Computations, W. E. Howland. *Purdue Univ.—Eng. Bul.—Extension Series No. 55*, vol. 27, no. 2, Mar. 1943, pp. 141–146. Two recently developed methods that have facilitated solution of some of hydraulic problems that city engineer meets; first is computation of flow or pressure drop in pipe network; second, is use of so-called probability paper, designed by A. Hazen.

FOUNDATIONS

HOSPITALS, EARTHQUAKE RESISTANCE. Earthquakes Are Only One Problem in Building Hospital in Equador, E. P. Sorensen. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 108–112. Hospital at Guayaquil, Ecuador, is located on filled ground over tidal mud flat; eight buildings are mainly reinforced concrete frames with brick walls; buildings have been designed for horizontal loads, and foundations have been constructed so as to form rigid network of reinforced concrete beams.

HYDROELECTRIC POWER PLANTS

WASHINGTON. Nisqually Project—Northwest Power to Be Supplemented. *Western Construction News*, vol. 19, no. 1, Jan. 1944, pp. 61–66. Description of City of Tacoma project, consisting of two dams, two power houses, 6,400-ft tunnel and highway and railroad relocation work.

INDUSTRIAL BUILDING

RECONSTRUCTION. Rebuild Burned Oakland Mill. *Western Construction News*, vol. 19, no. 1, Jan. 1944, pp. 67–69. Slip forms used by Austin

"Toughest Motor Grader on Earth!"

• *Heavy rains and flooded roads during the pursuit of Rommel in Libya could not stop these "Caterpillar" Diesel Motor Graders, needed for leveling airfields.*

• *A fleet of "Caterpillar" Diesel Motor Graders at work on a big landing field for Allied planes in the North African war zone.*

• *In New Guinea, this "Caterpillar" Diesel Tractor with sheep's-foot roller and "Caterpillar" Diesel Motor Grader build a new air strip.*

That's the way contractors and county officials have always talked about their "Caterpillar" Diesel Motor Graders. That's the way men in the armed forces talk about them today. For these rugged machines have proved themselves as versatile and dependable in war as they ever did on construction and maintenance jobs at home.

"Caterpillar" is building them now at the greatest production rate in history. But motor graders are so vitally needed by fighting men that only a few machines can be allocated by the War Production Board to purchasers in war-essential work.

If it comes to a choice between repairing your local roads or rushing through an emergency landing field for hard-pressed Yank airmen, there can be no argument. We've got to win the war.

However, there's a brighter side. This same huge "Caterpillar" production will be available for civilian needs as soon as war and government regulations permit. There'll be no time out for retooling. The machines you get will be war-tested—up to the minute in every detail. They'll have the same unfailing power and traction, the same ease of handling, the same wide range of blade positions that have always made "Caterpillar" Diesel Motor Graders first choice.

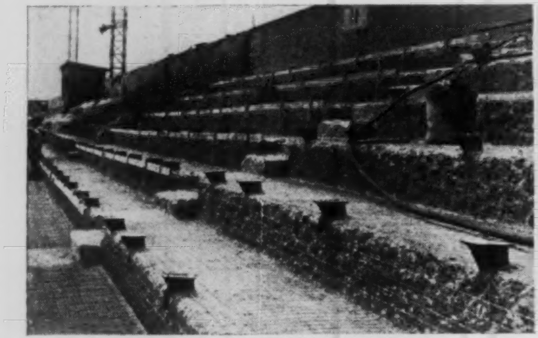
In the meantime, many who need "Caterpillar" Diesel Motor Graders must wait for peace. Do your best to keep your present equipment going. Enlist the "Fighting Four" for the duration. And if you reach the point where you must have a new machine, talk to your "Caterpillar" dealer. He will gladly explain how you can apply for it.

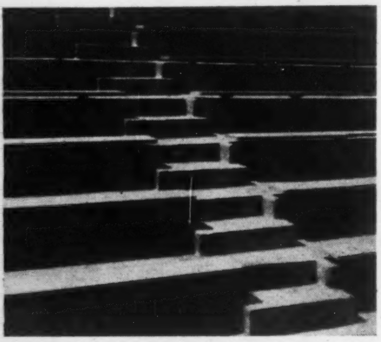
CATERPILLAR TRACTOR CO., PEORIA, ILL.

CATERPILLAR DIESEL
REG. U.S. PAT. OFF.

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



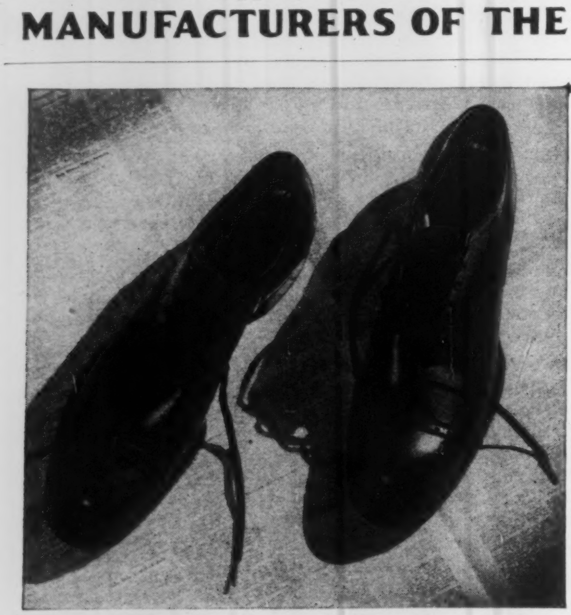


SAVED WITH "GUNITE"!

The photos show the stadium of the Sharon, Pa., High School, a poured concrete structure built in 1933. After only 8 years it became so disintegrated as to be weakened, and was reconditioned by us with 2" and more of reinforced "GUNITE." View to the left shows chipping and sandblasting completed and the reinforcing mesh placed. To the right is the completed job, better than when new.

Our Bulletin 2200 describes many similar and kindred jobs that we have done with "GUNITE," as well as scores of other profitable uses. Write for a copy.

MANUFACTURERS OF THE "CEMENT GUN"



can you fill these shoes?

Engineers who can fit into war-created jobs are needed—designers and production engineers for the machine-tool trades, aeronautical and shipbuilding industries—also some maintenance and top-management engineers. If you can fill these shoes, register now with the nearest office of the Personnel Service.

engineering societies PERSONNEL service, inc.

BOSTON
4 Park Street

CHICAGO
211 W. Wacker Drive

NEW YORK
8 West 40th Street

DETROIT
100 Farnsworth Ave.

SAN FRANCISCO
57 Post Street

Company in rebuilding Albers mill destroyed by fire early in 1943; bins are 105 ft high and surmounted by 20-ft headhouses, slip forms raising about 8 in. per hour by means of screw jacks manually operated; lightweight aggregate only in hoppers.

LAND RECLAMATION AND DRAINAGE

CULVERTS, BOX. Large Culverts at Aerodrome. *Concrete & Constructional Eng.*, vol. 39, no. 1, Jan. 1944, pp. 14–16. Description of large reinforced concrete, single-, double-, and triple-box culverts at United States airport; all-bolted, floating type of forms used.

EXCAVATION. Little River Drainage District. *Excavating Engr.*, vol. 38, no. 2, Feb. 1944, pp. 60–63, 96. Excavation of over 80 million cu yd of dirt converts 500,000 acres of forest and swamp land into rich agricultural country; district operates own Bucyrus-Erie $^3/_4$ cu yd dragline for drainage maintenance work.

ROADS AND STREETS. Hel-Cor Subdrains Cure Break-Up of New Mexico Road. *Highway Mag.*, vol. 34, Sept.-Oct. 1943, pp. 114–115. Several extensive failures of bituminous-treated base on New Mexico Forest Highway Route 15 (Cedro Canyon) were traced to water in subgrade; drainage of base was accomplished by removing existing subgrade and backfilling with large rock reinforcement having rubble outlets through earth shoulders; prevention of water reaching subgrade via underground seepage from hillsides above road was accomplished with 6-in. Armco Hel-Cor perforated corrugated pipe underdrain.

MATERIALS TESTING

AIRPORT RUNWAYS, BEARING TESTS. Assembly and Operation of Plate Bearing Test Equipment, H. K. Glidden. *Roads & Streets*, vol. 86, no. 12, Dec. 1943, pp. 50–52. Airways Engineering Branch of first region of Civil Aeronautics Administration has been utilizing plate-bearing tests in preparation of airport paving design; problems encountered both in assembling apparatus required for plate-bearing tests as well as in operation of equipment in field, and manner in which they were overcome.

BEAMS AND GIRDERS, STRESSES. On Stress Distribution in Cantilever Beams, F. B. Hildebrand. *J. Mathematics & Physics*, vol. 22, no. 4, Dec. 1943, pp. 188–203. Problem of determining state of stress in flanged or unflanged cantilever beam with narrow rectangular cross section, under prescribed transverse loading in plane of web plate; present paper gives exact solution of problem for web plate perfectly rigid in direction of applied loading. Bibliography.

CONCRETE AGGREGATES. Accelerated Tests of Concrete Expansion Due to Alkali-Aggregate Reaction, R. W. Carlson. *Am. Concrete Inst.—J.*, vol. 15, no. 3, Jan. 1944, pp. 205–212. Length changes up to 2 years in mortars containing 22 different aggregates reported; accelerating effects of sodium hydroxide added to mixing water and of storage temperatures of 110 F and 150 F shown.

CONCRETE AGGREGATES. Gravel and Stone in Comparable Mixes, W. S. Elliott. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 205–208. Gravel and crushed stone coarse aggregates were used in concrete test specimens made of respective aggregates to determine their relative compressive strengths; differing cement contents were used in several mixes for each aggregate, proportioned to provide, in so far as possible, same apparent workability; interpretation of results; comment on tests, by A. T. Goldberg, included.

CONCRETE AGGREGATES. Studies Relating to Mechanism by Which Alkali-Aggregate Reaction Produces Expansion in Concrete, W. C. Hansen. *Am. Concrete Inst.—J.*, vol. 15, no. 3, Jan. 1944, pp. 213–227. Expansion and cracking of certain concrete structures have been attributed to reaction between aggregate and alkali hydroxides produced by hydration of cement minerals; hypothesis of mechanism by which this reaction produces expansions in concrete is given. Bibliography.

CONCRETE MIXING. Concrete Strength Retained in 4-Hour Mixing Test. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, p. 107. Simple test of single 5-cu yd batch of concrete, mixed for 4 hours while samples were taken at 30-min intervals, indicated little loss of strength as measured by standard test cylinders broken at 28 days; test was made by Dept. of Public Works of City of New York.

FLOORS, CONCRETE. Proposed Minimum Standard Requirements for Precast Concrete Floor Units. *Am. Concrete Inst.—J.*, vol. 15, no. 4, Feb. 1944, pp. 305–317. Materials, aggregate, and steel; strength of concrete; unit stresses in concrete and reinforcement; concrete protection for reinforcement; manufacture; curing; identification and marking; transportation; tests; special types.

PUBLIC WORKS ENGINEERING

POSTWAR. City of New York Plans for Impact of Peace, I. V. A. Huie. *Eng. News-Rec.*, vol. 132, no. 8, Feb. 24, 1944, pp. 272–277. Survey of New York's plans; sewage treatment works, hospital program, health centers, bridges, wholesale produce market, and construction priority schedule are briefly discussed.

ILROADS, STATIONS AND TERMINALS

AILROAD TRACKS, RELOCATION. Seven Grade sings Eliminated by $3^1/_2$-Mile Route Change. age, vol. 115, no. 22, Nov. 27, 1943, pp. 856– As result of project involving relocation of miles of New York Central's four-track main at Herkimer, N.Y., tracks have been removed heart of village to outskirts, and seven rtant grade crossings have been eliminated; ils of project which involved construction of t 14 miles of tracks, passenger station, and bridges.

VERAGE AND SEWAGE DISPOSAL

NDUSTRIAL WASTES. Treatment of Cherry te Waters, C. H. Young. *Pub. Works*, vol. no. 11, Nov. 1943, pp. 25–26. Operation and iency of municipal sewage treatment plant at th East, Pennsylvania, has been markedly cted in recent years by waste waters disrged to sewer system from fruit canning or king plants; difficulties experienced in treatsuch wastes; supplemental chemical coagula during canning season is found to be help in ntaining satisfactory plant performance.

INNEAPOLIS–ST. PAUL. Operating Results of neapolis–St. Paul Sewage Treatment Plant. *Works*, vol. 73, no. 12, Dec. 1943, pp. 13–15, Analysis of record of 4-year operation of -mgd plant; costs and accomplishments of ens and grit chambers, settling tanks, effluent rs, concentration tanks, and vacuum filters; of sludge.

REGIONAL CONTROL. Regional Control of age, C. B. Townsend. *Civ. Eng.* (London), 38, no. 447, Sept. 1943, pp. 200–203. Coneration of reorganization of main drainage sewage purification systems in Great Britain; sibilities of extension to rural areas discussed. fore Inst. Sewage Purification.

SEWERS, PASADENA, CALIF. Pasadena Sewer Extended, J. H. Allin. *Western Construction* s, vol. 18, no. 12, Dec. 1943, pp. 551–553. sign of outfall sewer, trenching, and progress work discussed; reinforced concrete manhole ers and frames used to conserve critical mates.

SEWERS, STORM. Summary of Canadian Pracin Design of Storm Sewers, D. Jack. *Water & age*, vol. 81, no. 11, Nov. 1943, pp. 60, 62, -67. Brief review of history of design of storm erage systems; practice in Canada as realed by answers to questionnaire.

RUCTURAL ENGINEERING

CAMOUFLAGE. Camouflage; Adaptation of sic Principles of Landscape Architecture, A. zhugh. *Landscape Architecture*, vol. 33, no. July 1943, pp. 119–124. Discussion of basic hniques of camouflage, including selection of e, camouflage discipline, and use of camouflage terials and relationship to architectural techques.

HANGARS, DOORS. Erecting Box Girders of -Ft Span to Carry Doors of Navy Blimp cks. *Eng. News-Rec.*, vol. 131, no. 25, Dec. , 1943, pp. 908–910. Method of erection of ders described.

UNNELS

MINES AND MINING. Treasury Tunnel Is tended. *Western Construction News*, vol. 18, . 11, Nov. 1943, pp. 493–495. Description of rpose, driving operations, drilling, and mucking extension of tunnel in Colorado; new 6,300-ft nnel will extend existing Treasury Tunnel; new re and raise will connect to lower workings of mous Black Bean mine; reserves available are pper, lead, and zinc.

ATER RESOURCES

UNDERGROUND, SALT WATER INTRUSION. line Contamination of Coastal Ground Water Southern California, J. F. Poland. *Western ity*, vol. 19, no. 10, Oct. 1943, pp. 46, 48, and 50. oastal plain in Los Angeles and Orange Counties, alifornia, is about 775 sq miles in extent; large rt of water used in area is supplied by withrawals of ground water, which currently aggrete about 400,000 acre ft per year; salt water ntamination; industrial and oil field wastes.

ATER TREATMENT

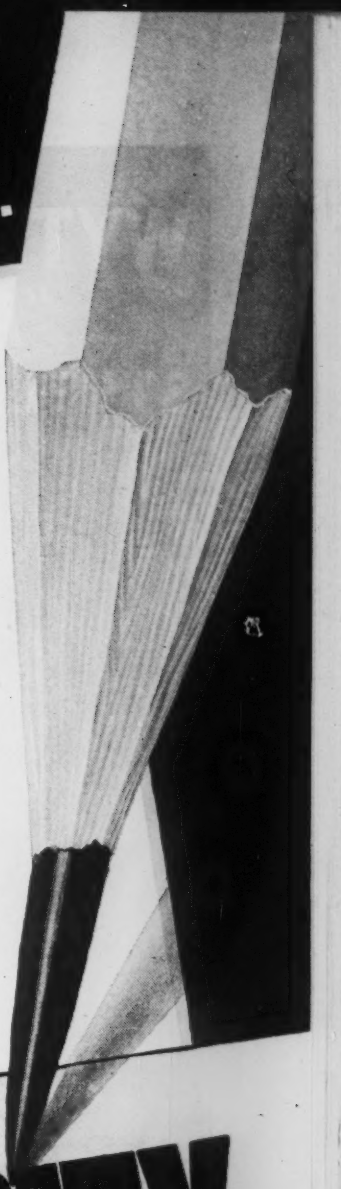
SEA WATER, SALT REMOVAL. De-Salting Seaater. *Water Works Eng.*, vol. 96, no. 24, Dec. 1, 43, pp. 1338–1339. Description of device, deeloped by Permutit Co., for converting sea water to drinkable form.

WATER POLLUTION, TEXAS. Emergency Treatent of Supply Due to Hurricane, F. M. Stead d C. A. Nau. *Water Works Eng.*, vol. 96, no. 4, Dec. 1, 1943, pp. 1334–1337. Failure of pply lowered pressure and polluted water seeped to delivery mines and back-siphonage polluted ater in tall buildings; disinfection methods llowed and results secured after hurricane in alveston, Tex.

ATER WORKS ENGINEERING

WOODEN CONSTRUCTION. Water Plant Built Available Materials, H. L. Kinsel. *Eng. News-Rec.*, vol. 131, no. 21, Nov. 18, 1943, pp. 757–759. Water-treatment facilities for ordnance plant ere constructed in 3 months with materials adily obtainable under present conditions; uildings are of timber frame, theater-of-operaion type; elevated water tank is of timber conruction; deep well units used for both low-lift d high-lift pumping.

Where PRECISION is All-important . . .



Too much depends on the reading-clarity of a blueprint to let a better tracing-quality pencil pass without investigation! **HI-DENSITY** line from a modern *Hi-Density Microtomic Van Dyke* pencil will hold crisp, sharp clarity in your finest details. Even on a high speed blueprint machine, or other quantity reproduction processes. 18 degrees from 9H to 7B, and 6 degrees (4B–2B–HB–2H–4H–6H) with rectangular "chisel point" leads.

HI-DENSITY

MICROTOMIC VAN DYKE

DRAWING PENCILS

MICROTOMIC
VAN DYKE
SLIDE RULE
The modern MICROTOMIC HI-DENSITY Lead
produces a ACTIVE HI-DENSITY Line.
EBERHARD FABER

IF YOU WISH THIS 20" SLIDE RULE 25¢

created by Eberhard Faber as a war-time service to engineers and draftsmen sign below and mail with

EBERHARD FABER PENCIL CO.,
Dept. CE-4
37 Greenpoint Ave., Brooklyn 22, N.Y

For enclosed 25¢ please send VAN DYKE 20" SLIDE RULE—war-time card printed edition.

*Name*____________________

*Street & No.*____________________

*City & State*____________________

WYTEFACE "A" TRADE MARK STEEL TAPES

K&E REG. U. S. PAT. OFF.

I'LL TAKE THE WHITE ONE EVERY TIME!

GRADUATED IN INCHES OR TENTHS

EASY-TO-READ, *raised* black graduations on crack-proof white surface . . . resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

EST. 1867
KEUFFEL & ESSER CO.
NEW YORK • HOBOKEN, N. J.
CHICAGO • ST. LOUIS • SAN FRANCISCO • LOS ANGELES • DETROIT • MONTREAL

Equipment and Materials

Stabilized Dirt Roads

A CHEMICAL METHOD of preventing mud by making soil waterproof has been developed by Hercules Powder Company and has been proved in use on roads, airplane landing fields, and other construction projects here and abroad, it was announced this month. Stabinol is the name of the resin compound employed. It can be used to stabilize unsurfaced dirt roads in rural areas where the traffic is light, or it can be mixed with soil that serves as the base on main highways with hard wearing surfaces. By mixing Stabinol with the top few inches of soil, a waterproof surface is obtained. The water will drain off or evaporate, rather than seep through the treated soil and turn it into mud. Stabinol-treated soil resists penetration of surface water, the chemical company said, and also the capillary rise of moisture from below.

Only fractional amounts of Stabinol are required, usually about one per cent of the total soil to be treated, and the "stabilized" soil has the same appearance as the original dirt. Stabinol does not increase the load-bearing capacity of soil, but it will prevent the soil from getting wet and thereby losing its strength. The announcement reports that this effect of soil stabilization will last for years. Roads laid down more than five years ago, for example, are still waterproofed.

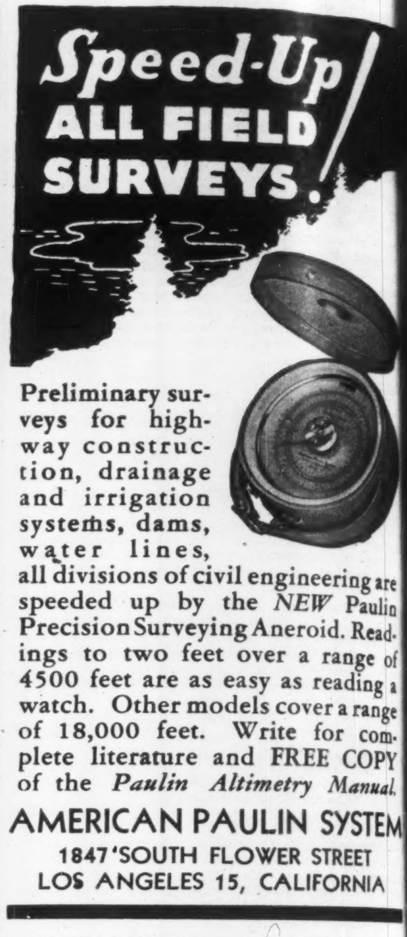
While the location of military projects such as airplane landing fields were not revealed, Hercules states that resin-stabilized roads have been put down in Delaware, Florida, Georgia, Mississippi, Ohio and South Carolina, with the cooperation of city and state highway departments. Soil has been stabilized under the supervision of the U.S. Army Corps of Engineers on projects in Alabama, Massachusetts, Mississippi, Missouri, North Carolina, and Virginia, while resin stabilizers have been used on Navy Department projects in Florida, Mississippi, and South Carolina. Part of the work abroad has been done in Panama and French Guiana.

Turnbuckles

RICHMOND SCREW Anchor Co., Inc., 816 Liberty Ave., Brooklyn, N.Y., are now manufacturing an extensive line of turnbuckles, in addition to their standard form-tying devices.

These turnbuckles are resistance-forged and are available in several types: Pressed Steel Body; dual Wire Strut Type and four Wire and Nut Type. All may be had in any combination of eye, hook and jaw connections. Sizes range from $^1/_4$ by 4 in. to 1 by 36 in.

Turnbuckle bodies assembled with eye and jaw fittings were torque tested at New York Testing Laboratories to yield point of fittings without deformation of the bodies. Detailed reports of these tests are available. A folder illustrates and lists these new turnbuckles.

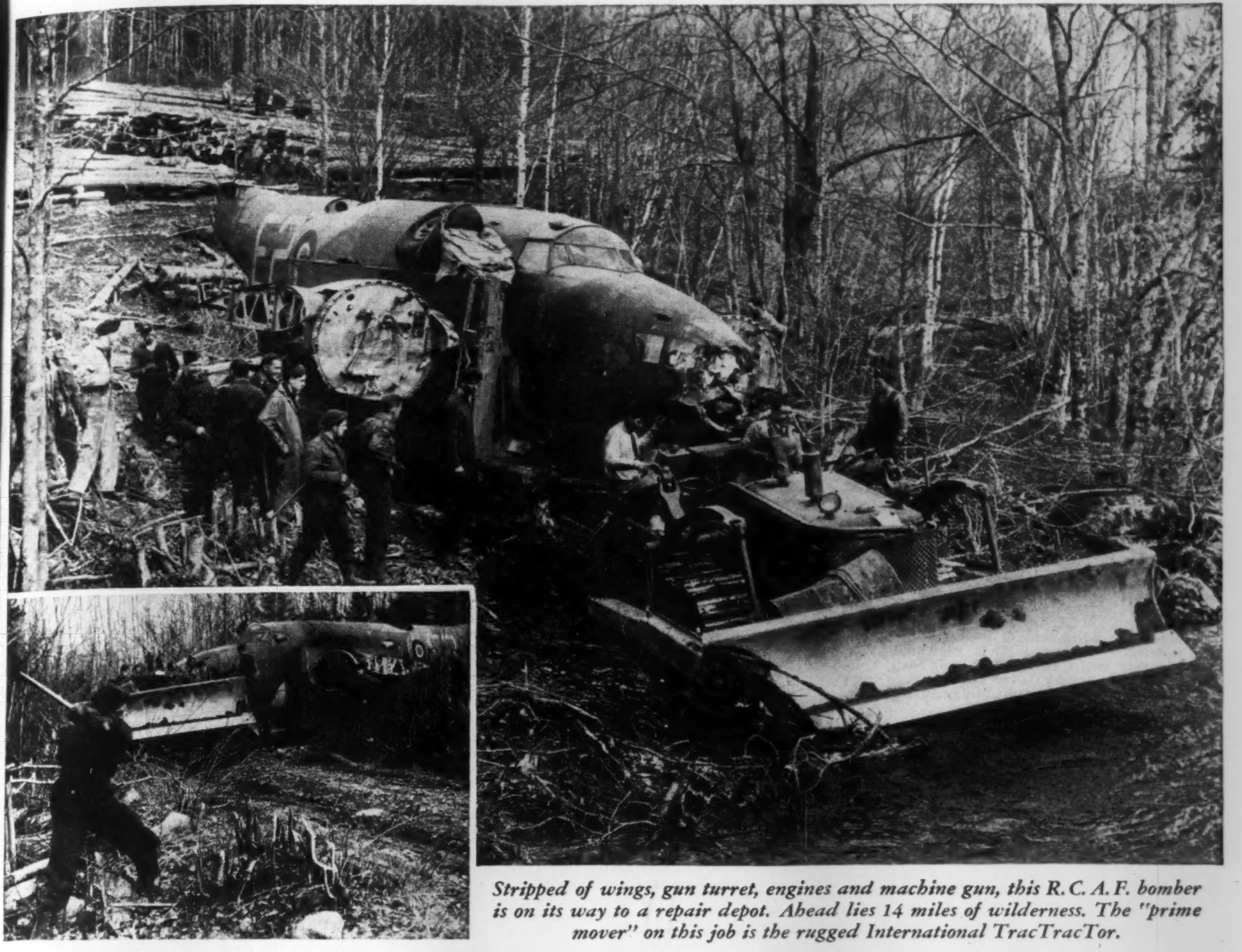

Speed-Up ALL FIELD SURVEYS!

Preliminary surveys for highway construction, drainage and irrigation systems, dams, water lines, all divisions of civil engineering are speeded up by the *NEW* Paulin Precision Surveying Aneroid. Readings to two feet over a range of 4500 feet are as easy as reading a watch. Other models cover a range of 18,000 feet. Write for complete literature and FREE COPY of the *Paulin Altimetry Manual.*

AMERICAN PAULIN SYSTEM
1847 SOUTH FLOWER STREET
LOS ANGELES 15, CALIFORNIA

KEEP THEM BURNING TO SPEED PRODUCTION

Return Empties Promptly—Cylinders Are Your Gas Supply Line



Stripped of wings, gun turret, engines and machine gun, this R. C. A. F. bomber is on its way to a repair depot. Ahead lies 14 miles of wilderness. The "prime mover" on this job is the rugged International TracTracTor.

RCAF Salvages the Bomber

—with INTERNATIONAL Power

Now it can be told . . . the story of the toughest aircraft salvage job ever attempted by the Eastern Command of the Royal Canadian Air Force in cooperation with detachments of the Canadian Army.

It's the story of an R. C. A. F. bomber that crash landed, with crew uninjured, on the ice of a Nova Scotian lake and the construction of a 14-mile road through forest and dense underbrush to get the bomber out. Today the bomber flies again.

The operation took a large crew five weeks to complete, but it was worth it. And when the day came to start pulling the bomber out, an International TracTracTor furnished the towing power over the temporary road.

Getting the bomber off the ice, weakened by the spring thaw, was as much of an engineering problem as the building of the road. Holes were cut in the ice and 56-foot tree trunks were sunk 23 feet to the lake bottom. The bomber was strapped to the poles and floating wooden platforms built.

Airmen then dismantled the bomber—first the machine gun, then the gun turret, the wings and the engines. Wooden sleds carried this equipment across the ice to the camp site.

Bomber salvage . . . road building . . . dirt-moving. They are all a part of the work of International TracTracTors in wartime, convincing proof that these versatile crawlers have the stamina and built-in performance you want, now and post-war.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL POWER

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Concrete. Computing Moments for Continuous Concrete Bridges, A. L. Googins, G. B. Canaga, and D. P. Babcock. *Pub. Roads*, vol. 23, no. 11, Jan.-Feb.-Mar. 1944, pp. 273–281. Method applicable to three symmetrical spans simply supported is described; charts prepared to simplify design of this type of bridge are given.

Concrete Girder. Floodway Crossed by Long Concrete Bridge Supported by 86-Ft Precast Piles. *Construction Methods*, vol. 26, no. 3, Mar. 1944, pp. 78–79, 138, 140, 142, 144, 146, 148. Supported by 24-in.-square concrete piles precast in lengths averaging 86 ft, high-level four-lane concrete girder bridge 18,778 ft long, comprising 458 spans of 41 ft, has been built to carry relocated U.S. Highway 190 in Louisiana across Morganza Floodway.

Reconstruction. Fixed Bridge Converted to Lift Span, S. J. Michuda. *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, pp. 402–407. Ten-lane, fixed bridge over Chicago canal converted into 28-ft vertical-lift bridge to pass war craft; methods used in converting structure without interrupting street or river traffic.

Suspension, Alaska. Peace River Bridge on Alaskan International Highway. *Engineering*, vol. 156, no. 4063, Nov. 26, 1943, pp. 425–426, (illustrations) 430. New bridge is of suspension type with 93-ft center span and 465-ft side spans; two towers carrying bridge stand in river.

Suspension, British Columbia. Building Peace River Bridge. *Highway Mag.*, vol. 35, Jan.-Feb. 1944, pp. 15–17. Notes on construction of bridge at Taylor Flat, British Columbia; main span is 930 ft; brief description of processing of concrete aggregates, erection of towers, and cable stringing.

Viaducts, Repair. Repair of Bombed Railway Viaduct. *Engineering*, vol. 156, no. 4066, Dec. 17, 1943, pp. 487–488, (illustrations) 490. Illustrated description of effect of bombing and repair of viaduct on Southern Railway near Brighton; it is constructed of brick and consists of 27 arches; it took about 18 months to complete and contains 8,000,000 bricks; rails are at height of about 70 ft above ground level; heavy bomb caused collapse of pier and of two arches which it supported; method of repair.

BUILDINGS

Materials Conservation. War Production Achievements Indicated by Combined Conservation Exhibition, R. Allwork. *Industry & Power*, vol. 46, no. 2, Feb. 1944, pp. 74–75, 90, 92, 94. Over 2,000 items were exhibited in Washington to show great progress Canadian and United States manufacturers have made in producing war supplies despite scarcities; examples of many outstanding substitutions were shown; precision casting; tools; silver brazing alloys; safety and technical equipment; plastics; plumbing; building materials; automotive; civilian goods.

School Buildings, Prefabricated. New Schools for War and Post War Needs, R. C. Kaestner. *Architect & Engr.*, vol. 155, no. 2, Nov. 1943, pp. 12–18. Illustrations, plans, and building procedures described in construction of schools needed for California areas, where influx of war workers created overcrowded conditions; details of procedure in manufacture and erection of prefabricated school buildings are given with statement that designs and methods can be used and improved upon for postwar construction.

CITY AND REGIONAL PLANNING

Cumberland, Md. Medium Size City Puts on Its Thinking Cap, C. J. Bruce. *Am. Water Works Assn.—J.*, vol. 36, no. 1, Jan. 1944, pp. 76–80. Proposed outline of report by engineering firm to Municipal Planning and Zoning Commission of Cumberland, Md., includes such items as flood control, water supply, sewerage, housing, zoning, etc.

San Francisco. Post-War Development Plan for San Francisco Waterfront, M. D. Tilton. *Architect & Engr.*, vol. 155, no. 3, Dec. 1943, pp. 12–23. Basic proposals of part of report of San Francisco Planning Commission dealing with postwar development plan for 23-mile shoreline; includes 9 plan drawings showing proposed improvements.

CIVIL ENGINEERING

Rubber Plantations, Latin America. Engineer's Role on Rubber Plantation, E. J. Cleary. *Eng. News-Rec.*, vol. 132, no. 10, Mar. 9, 1944, pp. 322–331. Description of construction practices in development by Ford Co. of more than 17,000 acres in Belterra, Brazil; road construction, housing, sanitation, electric power, construction machinery, and rubber cultivation activities are described and illustrated.

CONCRETE

Beams and Girders. Use of Alignment Charts, W. F. Covil. *Boston Soc. Civ. Engrs.—J.*, vol. 31, no. 1, Jan. 1944, pp. 38–39. Use of alignment chart for solution of equation for bond stress in concrete beams.

Construction, Vibrating. Maintenance Methods Prolong Life of Concrete Vibrators, R. F. Harrison. *Construction Methods*, vol. 26, no. 3, Mar. 1944, pp. 68–69, 116, 118, 120. Program of regular inspection and servicing carried out at Belair Concrete Shipyard, where schedules call for simultaneous use of as many as 70 vibrators.

Manholes, Covers. Reinforced Concrete Best Substitute for Manhole Covers. *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, p. 407. Summary of report on tests made by engineers in Los Angeles to find satisfactory substitute for cast-iron covers.

Mines and Mining, Construction. Concrete for Mines—What It Is and How It Should Be Made, A. E. Belton. *Coal Age*, vol. 49, no. 3, Mar. 1944, pp. 90–93. Definition of concrete; cement; aggregate; water; mixing; placing; advantages of concrete for underground use; classes of concrete for different degrees of exposure; forms; curing; additives for special purposes. Abstracted from thesis submitted for degree at School of Mines, West Va. Univ.

Mixing. New Method to Determine Moisture Content in Sand, C. W. Waters. *Eng. News-Rec.*, vol. 132, no. 10, Mar. 9, 1944, p. 341. Outline of method is given and table for obtaining moisture content in sand based upon combined weight in grams of sand and water.

ROADS AND STREETS

Access. Oklahoma Builds Divided Access Highway. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 198–199. Access road was constructed as two 22-ft unreinforced roadways separated by 4-ft paved median strip; new layout for intersection is illustrated.

Airport Runways. Well-Built Base Supports Asphalt Runways at Kentucky Airport. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 64–66, 86, 88–89, 92, 96, 102. Illustrated description of equipment and methods used in grading of areas and preparation of 10-in. stabilized clay sand gravel base resting on pervious sand sub-base 9 in. thick; airport is class 4 with four 5,500 by 150-ft asphalt paved runways being built for Covington, Ky.

Construction. Road Construction in United States, H. S. Keep. *Roads & Road Construction*, vol. 22, no. 253, Jan. 1, 1944, pp. 16–18. Various methods of construction are described: foundations; soil stabilization; tar as priming coat; traveling mixer; spreading machines; research. Before Joint meeting Soc. Chem. Industry and Instn. Mun. & County Engrs.

Construction. Roadways to Ford Bomber Plant. *Transport World*, vol. 94, no. 3024, Dec. 9, 1943, pp. 444–446. Brief commentary on building of highways and two 3-level "underpasses" to Ford bomber plant at Willow Run, Mich.; illustrations given.

Construction. Tractor Trains at 70° Below, H. J. McKeever. *Roads & Streets*, vol. 86, no. 12, Dec. 1943, pp. 48–49, 85. Details pertaining to road-building jobs on Canadian oil-development projects; $138,000,000 construction job being pushed by U.S. Army engineers and American contractors in northern Canada; bulldozers and angledozers were main trail-breaking tools.

Curves. Calculating-Machine Computation of Vertical Curves, T. C. Coleman. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 142–143. Vertical curves can be computed on calculating machine of shifting carriage type by considering curve as series of chords connecting points at which elevations are desired; rates of grade of successive chords can be computed on machine followed by computation of elevations desired; method used in computation is explained.

Design. Re-Planning of Roads in Built-up Areas. *Roads & Road Construction*, vol. 21, no. 252, Dec. 1, 1943, pp. 347–349. Precis of memorandum submitted by British Road Federation, which considers design and layout most appropriate to various types of road in built-up areas with due regard to safety, free flow of road traffic, economy, and requirements of town planning.

Firing Ranges, Pavements. Paving Record on Desert. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 194–195. Despite difficulties of transportation, labor scarcity, and weather that included wind, cold, dust storms, and snow, more than 111,000 cu yd of concrete paving was placed in 27 days, for bombing and gunnery range built on desert site in Nevada.

Highway Engineering, Research. Highway Research Studies Continued Despite War Restrictions. *Eng. News-Rec.*, vol. 132, no. 2, Jan. 13, 1944, pp. 52–53. Summary of papers at meeting of Highway Research Board on studies relating to design of rigid and flexible pavements, stabilization of pavement bases with cements and chlorides, and bridge design.

Highway Engineering, Research. Road Research in Wartime. *Engineer*, vol. 176, no. 4586, Dec. 3, 1943, pp. 444–445. Review of report summarizing Road Research Laboratory's activities; soil identification; membrane surfacings; airplane landing wheels; frost damage to concrete; wear of roads by tanks; by-pass experiments; wet aggregates; tire wear; solid and steel tires; camouflage.

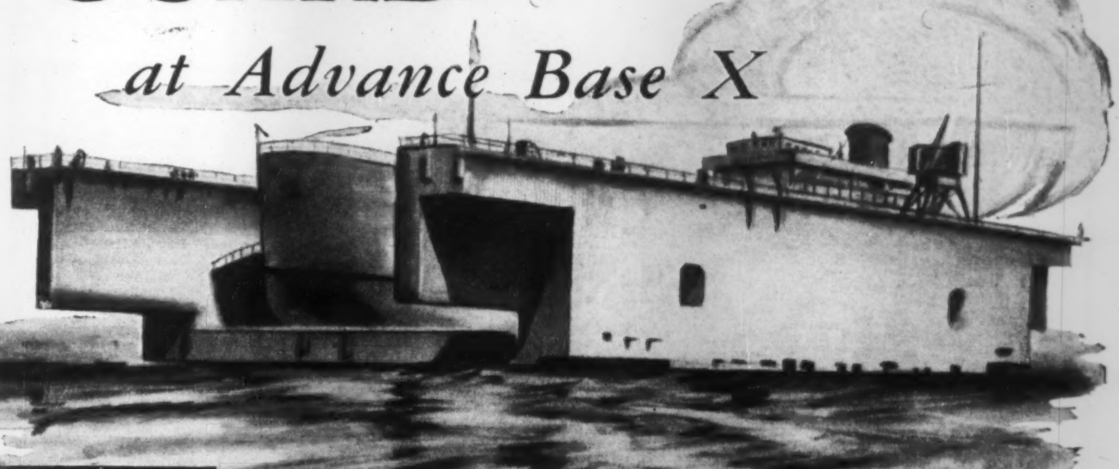
Highway Systems, Alaska. Finishing the Alaska Highway, H. W. Richardson. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 96–105. Description of highway and problems of construction; winter troubles; thaws; cutoffs and relocations; grading and surfacing; maintenance.

Highway Systems, Alaska. Alaska Road Completed in '43. *Eng. & Contract. Rec.*, vol. 57, no. 2, Jan. 12, 1944, pp. 14–17, 32. Highway built in 1942 widened and graded to military road standards; construction details.

Highway Systems, California. First Unit of Reconstruction on Franklin Canyon Highway Completed, F. W. Montell. *Calif. Highways & Pub. Works*, vol. 21, nos. 11 and 12, November-December 1943, pp. 8–9. Notes on reconstruction of portion of State Highway Route 106 in Franklin Canyon, Contra Costa County, carried out to provide more modern traffic facilities for industrial areas of Martinez and Pittsburg.

Highway Systems, California. Modern Design Features Mark New Highway Construction in San Diego, E. E. Wallace. *Calif. Highways & Pub. Works*, vol. 21, nos. 11 and 12, November-December 1943, pp. 2–3 and 7. Addition to and modernization of highway system of San Diego accomplished recently with completion of Rosecrans-Mission Valley Highway; system is 3.5 miles long and provides 4-lane divided, concrete-paved highway; illustrated description given.

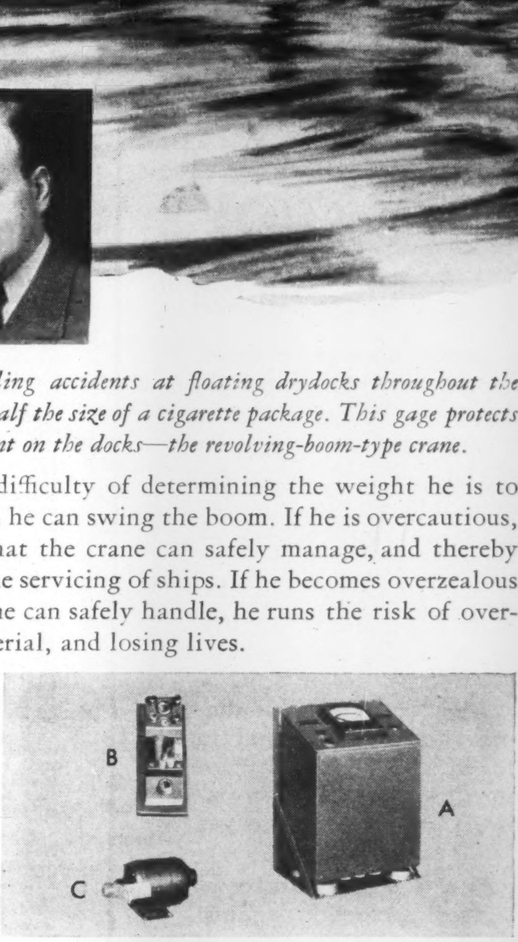
ON GUARD at Advance Base X



By J. P. Smith, Industrial Engineering Division, General Electric Company

ON GUARD against crippling accidents at floating drydocks throughout the world is a tiny gage no larger than half the size of a cigarette package. This gage protects one of the busiest pieces of equipment on the docks—the revolving-boom-type crane.

Every craneman knows the difficulty of determining the weight he is to handle, and the radius at which he can swing the boom. If he is overcautious, he hesitates to handle loads that the crane can safely manage, and thereby slows the work—in this case the servicing of ships. If he becomes overzealous and picks up more than the crane can safely handle, he runs the risk of overturning the crane, ruining material, and losing lives.



The crane-stability gage enters the picture

This gage (components shown in picture) has removed the necessity for guesswork in crane operation. Now, by glancing at an indicating instrument (A) the operator can determine whether he is "safe," or getting "out of bounds." It is possible even to interlock the crane-stability gage with the electric controls of the crane in such a way that the operator will automatically be prevented from lowering the boom or hoisting the load if the gage indicates an overload.

The load causes stretch of one of the crane's structural members to which the magnetic strain gage (B) is attached. This stretch is measured accurately by the gage by the changing of the gage's .005-inch air gap, which in turn causes movement of a pointer over the five-inch scale of the instrument near the operator.

The boom-angle compensator (C), which measures the boom angle, constantly corrects the reading as the radius changes. Thus the operator knows, at any radius, when he is handling his maximum safe load.

What the crane-stability gage does

1. Gives the operator a continuous, accurate indication of crane stability at all times.
2. Prevents unsafe operation by giving an alarm automatically when the load limit is reached. Also, the gage can often be interlocked with the crane controls.
3. Measures crane stability *whether the load is stationary or in motion.*

In thus eliminating one of the hazards of crane operation, G.E. has enabled workers in the heavy construction industry to obtain maximum output from expensive equipment, with less danger to life and material. Whenever you have an electrical problem, call on G-E engineers. They will be glad to work with you. *General Electric Company, Schenectady 5, N. Y.*

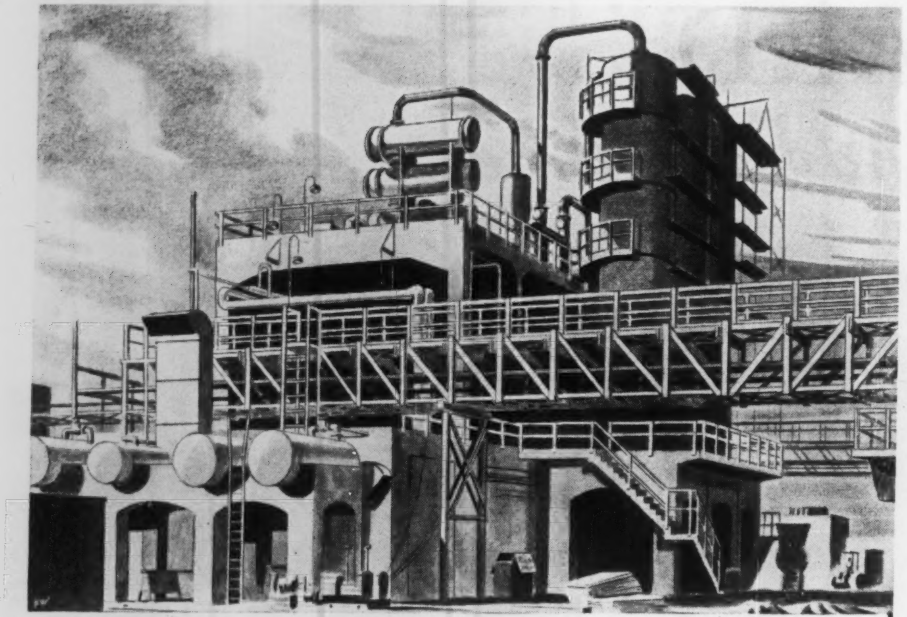
★

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

★

GENERAL ELECTRIC

655-36-8498



Flame-proof wood helps U. S. deliver "home grown" rubber

SYNTHETIC rubber plants are using flame-proof wood in their stairways, platforms, supports, walkways and railings. Wood is light in weight, easy to handle and erect. It goes up fast.

MINALITH* fire retardant, driven deep into the wood by vacuum-pressure treatment, enables it to stand up under flash fires. It won't carry fire, simply chars under continued exposure to flame. Structural members retain their high strength without sudden collapse when exposed to flame.

WIDELY USED in the war effort for structures where fire hazards exist—warehouses, blimp hangars, loading platforms—this flame-proof lumber promises to be equally valuable in postwar construction. So, too, does Wolmanized Lumber*: ordinary wood made highly resistant to decay and termite attack by impregnation with Wolman Salts* preservative. A long history of successful performance proves the reliability of the vacuum-pressure process employed in treating with either compound.

CONSIDER Minalith-treated lumber as a means of combating fire: Wolmanized Lumber for protection against decay and termite attack. All of the usual advantages of building with wood are retained. The wood is clean, odorless and paintable. These two types of treated lumber will be available, just as soon as the war permits, through regular trade channels. American Lumber & Treating Company, 1654 McCormick Bldg., Chicago 4, Illinois.

*Registered trade marks

WOOD THAT'S *Alloyed* FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

HIGHWAY SYSTEMS, EL SALVADOR. Highway and Bridges of El Salvador, J. C. Black. *Road & Streets*, vol. 86, no. 12, Dec. 1943, pp. 53-56. El Salvador has distinction of being first to complete that portion of Pan-American Highway lying within its boundaries; general requirements for highways; surfaces; Pan-American Highway; other roads; note on bridges of El Salvador.

HIGHWAY SYSTEMS, LOUISIANA. Louisiana's Postwar Program Emphasizes Traffic Relief in Urban Areas, H. B. Henderlite. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 125-127. Chief Engineer of Dept. of Highways states Louisiana's postwar plans; means for financing this work; projects and major bridges being considered are tabulated; design standards are being improved over those in use before war; employment also considered.

HIGHWAY SYSTEMS, NEW YORK STATE. Reconstruction of Existing Roads Will Dominate New York's Program, C. H. Sells. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 128-130. Main task in postwar period will be reconstruction of existing highways to improve their alinement, grades, and width; new work will be limited to extensions of state's parkway systems and construction of system of "thruways"; ample amount of work is ready for contract, and funds in sufficient amount to start very large program are available.

HIGHWAY SYSTEMS, PAN-AMERICAN. Construction Details on Inter-American Highway, E. W. James. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 71–73, 134, 136, 138, 140, 142, 144, 146, and 148. Problems of transporting materials and construction on highway between Guatemala and Panama include clearings, soils, drainage structures, bridges, and sanitation; types of equipment used are described.

HIGHWAY SYSTEMS, PLANNING. Postwar Highway Plans Analyzed, V. T. Boughton. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 116–122. Objectives to be met in planning, and review of plans of leaders in highway field.

HIGHWAY SYSTEMS, POSTWAR. Postwar Highways Should Be Planned and Financed Now! C. M. Upham. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 76–77, 124, 126, 128, 130, 132. Discussion of importance of road construction to avoid postwar depression; methods of financing, particularly sale of bonds, and need for new highways.

HIGHWAY SYSTEMS, UNITED STATES. Interregional Highway System Proposed for Postwar Construction, C. S. Hill. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 144–145. Creation of inter-regional highway system of 33,920 miles by reconstruction and relocation of outmoded highways has been proposed; work on system would be undertaken as postwar project and carried forward at rate of about $750,000,000 per year for several years; costs would be divided about equally between states and federal government; general location of routes proposed are shown on map.

INTERSECTIONS. Grade Separation Eliminates Traffic Hazards to Shipyard Workers, W. A. Rice. *Calif. Highways & Pub. Works*, vol. 21, no. 11 and 12, November-December 1943, pp. 6–7, 19. Details pertaining to Waldo grade separation of U. S. 101 and Marin City road; bridge is reinforced concrete slab structure, consisting of four 19-ft spans and one 13-ft span on concrete bents; it provides two 14-ft traffic lanes and 10-ft sidewalk beneath structure; deck accommodates 25-ft roadway to northbound traffic and 37-ft roadway for southbound traffic, separated by 4-ft curbed division strip.

IRAN. Roads in Iran, M. Hajhir. *Roads & Road Construction*, vol. 12, no. 251, Nov. 1, 1943, pp. 320–321. Brief note regarding road construction in Iran during recent years.

MAINTENANCE AND REPAIR. Planning Highways Depot, H. W. Whitehorn. *Roads & Road Construction*, vol. 22, no. 253, Jan. 1, 1944, pp. 27–28. Author states that with increased amount of work which would fall on highways depots during postwar reconstruction period, many would have to be enlarged; various ways in which existing depots could be improved; need for better transport facilities, cleanliness, and amply covered dry storage for special stores, including carbide paraffin, cement, emulsions and salt; layout of new deposits. Extracts from paper before Inst. Works & Highway Superintendents.

RAILROAD CROSSINGS, GRADE SEPARATION. Overcome Many Complications in Long Grade-Separation Project, R. L. Anderson. *Ry. Age*, vol. 116, no. 6, Feb. 5, 1944, pp. 307–310. Continuous railway-highway grade-separation project 3.51 miles in length, completed at Winnetka, Ill., which involves two adjoining double-track railroads and cost $4,280,000; construction details given. Before Western Soc. Engrs.

RELOCATION. Curves and Flood Hazards Eliminated by Relocation on Redwood Highway, A. M. Nash. *Calif. Highways & Pub. Works*, vol. 21, nos. 11, 12, November-December 1943, pp. 16–17, 20. Completion of grading and surfacing project between town of Hopland and Crawford's Ranch in Mendocino County marks reconstruction to modern standards at cost of approximately $327,000 of last remaining section

YOU'LL FIND NO "OIL HOGS" HERE

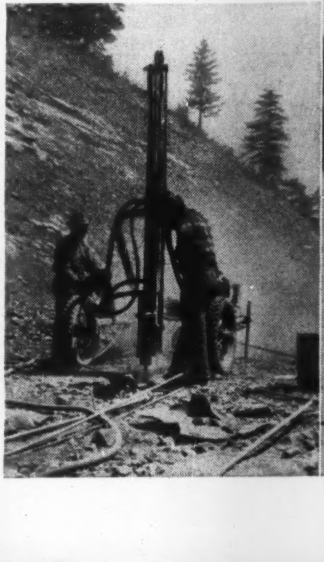
Not with Gardner-Denver Water Cooled Portable Compressors on the job!

Because they are fully water cooled, they run cooler—use less lubricating oil. Rarely is it necessary to add any oil between regular oil changes.

And because they run cooler, they deliver cooler air—cause less wear on hose.

You'll find Gardner-Denver "Portables" equally efficient in winter or summer—at high altitudes or low. In winter, warm water from the engine circulates through the cylinder jackets, thoroughly warming the compressor before it is started. In summer, the circulating water keeps the compressor cool.

Investigate these "oil saving" water-cooled compressors and other Gardner-Denver cost-cutting equipment. Write Gardner-Denver Company, Quincy, Illinois.



For faster drilling and extra maneuverability, even over the roughest ground, check the Gardner-Denver UM-99 Wagon Drill. Ability to handle full six-foot steel changes quickly, means faster drilling on deep holes.

MAKES AIR Cost Less AND Do More

GARDNER-DENVER

Since 1859

WATER WILL BE AN URGENT POSTWAR NEED

Maybe it is entirely too early to order your postwar Water System. Maybe you can't even determine the amount of water you may need. But you do know that you are going to be pretty "hard boiled" about such things as long-life quality—top flight efficiency—and extra low operation cost.

Summing it up, you are going to demand the very features that have made Layne Water Systems world famous. But you are not going to buy on reputation alone. You are going to ask for a lot of bed-rock facts and figures. You will want to know exactly what you are getting for your dollars.

Fortunately, you are going to be the very kind of prospect that Layne likes to meet—the kind of buyer that will understand and fully appreciate the incomparably fine features found only in Layne Turbine Pumps and Water Systems. You are going to be a dandy postwar customer, and like hundreds of other "look before you leap" buyers, you are going to be a 100 percent satisfied Layne customer.

For literature and further facts, address Layne & Bowler, Inc., General Offices, Memphis (8), Tenn.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

LAYNE

WELL WATER SYSTEMS
DEEP WELL PUMPS

BUILDERS OF WELL WATER SYSTEMS FOR INDUSTRIES AND MUNICIPALITIES

of obsolete road on Redwood Highway, U.S. 101; construction details given.

Road Machinery, Maintenance and Repair. Repair Shops Service California's Road Maintenance Equipment, R. H. Stalnaker. *Construction Methods*, vol. 26, no. 2, Feb. 1944, pp. 68–69. Illustrated description of headquarters shop of California Division of Highways, with floor area of 44,800 sq ft, which is equipped to make repairs on or rebuild both light and heavy road-building machinery.

Snow and Ice Control. Ordnance Depot Uses Rock Salt to Help Free Roads of Snow. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, p. 114. Rock salt is being used in large quantities to keep roads and working platforms at northern ordnance depot free of ice and snow; salt is spread over pavements soon after snow begins to fall to keep accumulations from freezing to surface and to facilitate work of plows; similar treatment is applied to platforms of munitions igloos.

Soil Cement. Use of Soil-Cement Mixtures for Base Courses. *Roads & Road Construction*, vol. 22, no. 253, Jan. 1, 1944, pp. 23–26. Extracts from Wartime Road Problems Bulletin No. 7 issued by Highway Research Board, Washington, D.C.; latest information on materials and construction methods now in use for building soil cement base courses for pavements; types of construction described cover incorporation of cement with subgrade soils, borrow soils, pit-run materials, and combinations of these materials by mixed-in-place, traveling, and stationary plant methods.

Soils, Testing. Compaction Machine Prepares Soil Samples for Stability Test, V. R. Smith. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, p. 183. Method of operation of mechanical compactor, used for preparation of stability test specimens which would be reliable guides to proper design for pavement constructed with soil used in test.

Stabilization. Some Factors Affecting Stability of Bituminous-Aggregate Base Courses, A. H. Layman. *Purdue Univ.—Eng. Bul.—Extension Series No. 55*, vol. 27, no. 2, Mar. 1943, pp. 74–79. Investigation of shearing resistance in unconfined compression; only one type of bituminous material and one aggregate were employed; bituminous material was soft asphaltic cement conforming to Indiana State Highway specification for OH-2; aggregate was Mitchell limestone, hard, angular aggregate with absorption of 1%.

Street Railroad Tracks, Reclamation. Seattle Rids Pavements of Steel Rails. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 202–204. Methods of rail removal and repaving employed in removing rail-skid hazard described and illustrated; rails 35 years old broke easily, presumably from crystallization; repaving costs had to be kept low; rail removal has effect of adding one or more lanes to traffic capacity of streets.

SANITARY ENGINEERING

Airports, Sanitation. Waterworks and Sewerage at R.C.A.F. Aerodromes in No. 1 Training Command, G. G. Heid. *Water & Sewage*, vol. 81, no. 12, Dec. 1943, pp. 11–19, 34. Discussion of water supply and treatment, sewage-disposal systems, typical sewage plants, and details of sewage units.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. Reduction of Moisture in Activated Sludge Filter Cake by Electro-Osmosis, R. E. Beaudoin. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1153–1163. Experiments undertaken to find out whether moisture content of filter cake produced with ferric chloride could be further reduced by use of electric current; results prove use not economically feasible.

Camps, Military. Operating Experiences at Army Sewage Treatment Plants, J. T. Franks and C. A. Obma. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1088–1095. Discussion of experience with activated-sludge, high-rate filters, Hay process, standard-rate filters and digesters, and conclusions drawn. Before Rocky Mountain Sewage Works Assn.

Cleveland, Ohio. Problems of Plant Operation and Coordination, W. E. Gerdel. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1183–1193. Problems of personnel and supplies, grit removal, foaming of gas vents, scum formation in digestion tanks, operation flexibility, and so forth, at plant in Cleveland, Ohio. Before Ohio Conference on Sewage Treatment.

Plants, Problems. Problems in Design, Construction, and Operation of Very Small Sewage Disposal Plants, F. L. Flood. *Sewage Works J.*, vol. 16, no. 1, Jan. 1944, pp. 90–99, (discussion) 99–103. Discussion of cesspools and leaching cesspools, septic tanks, sludge drying beds, tile fields, treatment of kitchen wastes, subsurface filters, and intermittent sand filters; processes and plants considered are those suitable for country estates, schools, institutions, summer camps, hotels, and for general housing, where common sewers are not available.

Postwar. Post-War Projects of Sewage Works Equipment Manufacturers, W. B. Marshall. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1054–1057. Questionnaire sent to all members of Water & Sewage Works Mfrs. Assn. on possibilities for radical improvements in postwar period. Before Federation Sewage Works Assns.

Postwar Planning. Consulting Engineer and Postwar Planning, C. A. Emerson. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1045–1049. Role of consulting engineer in advance planning in field of sewage and industrial wastes treatment; finances; unexpected developments; determination of future needs. Before Federation of Sewage Works Assn.

Sewers, Detroit, Mich. Municipal Postwar Project for Sewerage Development, C. L. Palmer. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1057–1061. Survey of organizational efforts in planning for postwar. Before Federation of Sewage Works Assns.

Sewage Filters, Trickling. High Rate Trickling Filters—Their Design and Operation, S. M. Ellsworth. *Sewage Works J.*, vol. 16, no. 1, Jan. 1944, pp. 65–75. Brief discussion of early, conventional types; description of general features of design and operation of high-rate filters; account of plant at army cantonment; discussion of construction costs and place of high rate filters in field of sewage treatment. Before New England Sewage Works Assn.

Sewage Filters, Trickling. Operation of Trickling Filters, F. Bachmann. *Sewage Works J.*, vol. 16, no. 1, Jan. 1944, pp. 147–157. Principles and methods of operation are treated in some detail, attention being given to action of bacteria in purifications, cause and elimination of odors, nozzle clogging, pooling and files, function of dosing siphon and revolving distributor and operation of final clarifier.

Sewers, Storm. Design of Storm Sewers, D. Jack. *Eng. & Contract. Rec.*, vol. 56, no. 51, Dec. 22, 1943, pp. 16–19, 23–24, 30–31. Brief review of some of history of design of storm sewers; description of Canadian practice; investigation relative to storm flow; determination of rainfall curves; summary of information received from various municipalities extending from Montreal in East to Vancouver in West. Before annual convention of Canadian Inst. on Sewage & Sanitation at Niagara Falls, Ontario.

Sludge Digestion. Effect of Addition of Nitrogen on Digestion of Paper Pulp, C. P. Straub. *Sewage Works J.*, vol. 16, no. 1, Jan. 1944, pp. 30–41. Results of test in which, after seeding tanks with digested sludge, fresh raw sludge and wet pulp were added, followed by ammonium sulfate, which was later replaced by sodium nitrate because of odor; sodium nitrate had decided effect on digestion of paper pulp in that it reduced rate of gas production, reduced methane content and caused more complete breakdown of volatile solids.

Treatment, Aeration. Some Biological Aspects of Hays Process of Sewage Treatment, J. B. Lackey and R. M. Dixon. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1139–1152. Biological examination correlated with examination of construction and operational data for 11 Hays process sewage-treatment plants.

Treatment, Biofiltration Process. High Rate Biological Sewage Treatment, S. A. Greeley. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1062–1078, (discussion) 78–87. Suggested procedure for rating and comparing different types of high-rate sewage treatment plants for given set of sewage characteristics and required degree of treatment; meaning of "high rate"; current high-rate terms; description of high-rate plants; operating data and costs.

Treatment Plants, Akron, Ohio. Wartime Effects on Treatment Plants, T. C. Schaetzle. *Sewage Works J.*, vol. 15, no. 6, Nov. 1943, pp. 1193–1196. Changes that have taken place in sewage strength at Akron, Ohio, plant and steps taken to solve problems through substitution of materials and equipment. Before Ohio Conference on Sewage Treatment.

Water Pollution. Relation Between Stream Flow and Quantities of Nitrates, W. Rudolfs and H. Heukelekian. *Sewage Works J.*, vol. 16, no. 1, Jan. 1944, pp. 132–138. Results of studies carried out on Raritan River in New Jersey to correlate quantities of nitrates found with degree of pollution and rate of recovery in stream.

Water Pollution, Toronto. Temporary Measures to Relieve Toronto Sewage Problem. *Water & Sewage*, vol. 81, no. 12, Dec. 1943, pp. 22, 36, 38–42. Report of meeting by Toronto Board of Control to discuss possibility of reducing pollution of Lake Ontario prior to completion of new sewage-disposal plant.

STRUCTURAL ENGINEERING

Beams and Girders, Continuous. Continuous-Beam Computations Simplified, J. T. Weldon. *Eng. News-Rec.*, vol. 132, no. 6, Feb. 10, 1944, pp. 200–201. Computations involve linear equations only; analysis of typical beam loadings; special application of method to design of wood sheetpile dock wall.

Beams and Girders, Continuous. Continuous Beams on Elastic Supports, W. L. Elsby. *Concrete & Constr. Eng.*, vol. 38, no. 11, Nov. 1943, pp. 339–347. Analysis of problem concerned in driving reinforced concrete piled foundation to support heavy reinforced concrete continuous beam running under crane tracks, slipways, jetties, and so forth.

Beams and Girders, Wooden. Army Warehouse Framed With Laminated I-Section Timber Members. *Construction Methods*, vol. 26, no. 1, Jan. 1944, pp. 50–52, 141–142. In new warehouse, 156 by 2,162 ft in plan, bays 45 ft wide and 40 ft long are framed with shop-fabricated timber members, consisting of solid plywood web with laminated dimensioned lumber, glued and doweled as necessary, for flanges and stiffeners; beams are lighter in weight, shallower in depth and save lumber over use of timber trusses.

Railroad Structures, Masonry. Report of Committee 8—Masonry. *Am. Ry. Eng. Assn.—Bul.*, vol. 45, no. 443, Jan. 1944, pp. 225–252. Revision of manual; bibliography and review of current engineering literature pertaining to railroad masonry work; specifications for concrete and reinforced concrete railroad bridges and other structures; means for conserving labor and materials, including adaptation of substitute non-critical materials.

Walls, Concrete. New System of Climbing Shuttering. *Concrete & Constr. Eng.*, vol. 38, no. 12, Dec. 1943, pp. 389–390. New method of shuttering for concrete walls uses shutter plates of any convenient size which slide in channel shaped uprights.

TRAFFIC CONTROL

Traffic Dividers. Dividing Urban Highways, R. N. Ricketts. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, pp. 140–141. Pre-cast concrete dividers spaced 12 ft apart and set at angle of 45° to lines of traffic, installed near Columbus, Ohio, at about one-third cost of continuous divider; advantages over solid dividers.

Traffic Dividers. Traffic Divider Experiment Conducted at Seattle, Wash. *Eng. News-Rec.*, vol. 132, no. 4, Jan. 27, 1944, p. 143. Precast concrete medial dividers, set at angle, are used on Montlake Blvd., Seattle, as part of traffic control experiment; dividers have vertical surfaces that reflect headlights from any angle; height is 6 in.; plan dimensions are 16 by 34 in.

TUNNELS

Railroad. Eliminates Old Tunnels to Remove Restrictions to Traffic. *Ry. Age*, vol. 116, no. 2, Jan. 8, 1944, pp. 143–146. Details of project being completed by Chesapeake & Ohio Railroad, which involves construction of new 4,000-ft bore through Blue Ridge Mountains, permitting use of more powerful locomotives and larger freight cars, and enabling more traffic to be handled on that division.

Rails, Welding. New Heavy-Duty Rail Welded in 1,000-Ft Sections Skidded Into Moffat Tunnel. *Construction Methods*, vol. 26, no. 1, Jan. 1944, pp. 76–77. Track has been reconditioned by replacing original 112-lb rail with 130-lb rail, thermit welded into continuous sections which were pulled into place by locomotive; 72,000 lin ft of continuous rail involved.

WATER TREATMENT

Experiences with Up-Flow Basins. Experiences with Up-Flow Type Basins, H. O. Hartung. *Water Works & Sewerage*, vol. 91, no. 1, Jan. 1944, pp. 12–14. Results of experience with up-flow units in attempt to answer questions regarding performance characteristics in regard to softening and clarification.

Filtration, Flocculation. Some New Features in Design of Vertical Flocculation Units, C. G. Hyde and H. F. Ludwig. *Am. Water Works Assn.—J.*, vol. 36, no. 2, Feb. 1944, pp. 151–162. Description of improvements which, according to authors, can readily be incorporated into designs of tanks of vertical flow type; observations on hydro-mechanics of paddle design in tank used at plant in Martinez, Calif. Bibliography.

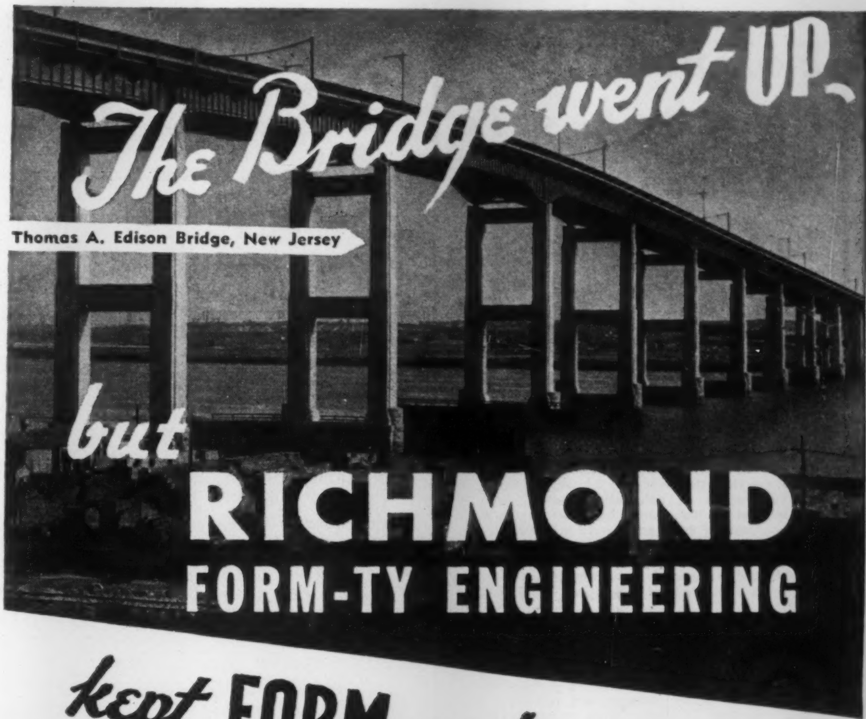
Removing Material. Removing Suspended Material. *Water Works Eng.*, vol. 97, no. 4, Feb. 23, 1944, pp. 187–188, 206–207. Description of methods of removing suspended material from water supply; coagulation; chlorination and use of screens or trash racks are discussed.

WATER WORKS ENGINEERING

New Jersey. Commission-Operated System Supplies Three Cities, R. E. Bonyun. *Water Works Eng.*, vol. 97, no. 1, Jan. 12, 1944, pp. 18–21. Description of operation of Passaic Valley Water Commission System, which owns one source of supply, obtains some 38 mgd from another source, and supplies Paterson, Passaic, and Clifton; treatment plant and pumping station.

New York, N.Y. Interesting Distribution Practices in Queens Borough, N.Y., J. P. Longergan. *Water Works Eng.*, vol. 97, no. 1, Jan. 12, 1944, pp. 22–24, 50–52. Discussion of such experience as raising 36-in. main without cutting pipe; maintenance of 45 pieces of motor equipment; maintenance of valves; inspection of hydrants; service installations; meter practices.

Tampa, Fla. Tampa Increases Elevated Storage in Water System to 3,100,000 Gallons. *Water Tower*, vol. 30, no. 3, Jan. 1944, pp. 4–5. New supply main ranging from 36 to 12 in. in diameter and 1,500,000-gal radial-cone bottom elevated tank are improvements in water-works system.



kept FORM costs down!

RICHMOND 10-WAY SAVING PLAN

1—Provides all kinds of form-tying devices to choose from.
2—Economizes because Form Ties cost less to use than wire, band or rod ties.
3—Supplies Form Ties engineered for safe working loads of 1,500-30,000 lbs.
4—Assures faster erecting and stripping plus big lumber savings.
5—Promotes perfect alignment for correct wall thickness.
6—Protects job against rust staining with "1 to 3 inch cutback".
7—Saves shipping and handling costs because of scientifically reduced weight.
3—Is only known prevention against termite destruction.
9—Enables you to borrow working parts and to pay only for ties in the job.
10—Is planned from job plans to use the right size of ties and the least number of ties to fit forming for fast, safe work.

Whether you are planning, designing or estimating on a concrete job—large or small—there are *Dollars* to be saved on *Form Work* by planning.

Richmond Services to Architects, Engineers and Contractors include recommendations on Form Tying Devices, Consultation on Form problems and Forming used, as well as Estimates on requirements, all without obligation.

The list of big jobs on which Richmond Form Ties have saved on form-work costs and speeded up completion is a blue-ribbon list of modern construction. It includes mammoth projects everywhere—and small contracts, too. There is a Richmond Tie engineered for every type of concrete construction. We plan a Tie to fit the work.

For information, write to our Planning Division.

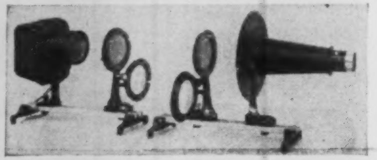
Manufacturers of Quality Building Products · The Producers' Council

See our catalog in Sweet's

RICHMOND SCREW ANCHOR COMPANY, INC.
816 LIBERTY AVENUE · BROOKLYN, NEW YORK
Established 1911 ·

Time and Labor Saving Construction Devices · For Concrete Construction

Polaroid* . . .
Photoelastic Polariscope
for Stress Determination



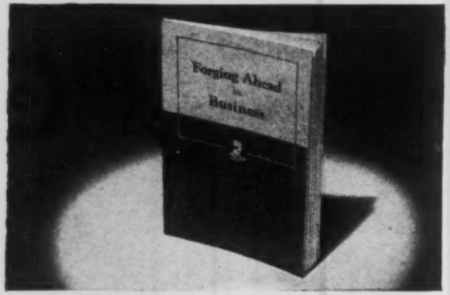
To the machine designer, photoelastic stress analysis is not only of value in the verification of calculations based on theoretical solutions, but also in the solution of problems where theoretical analysis is not available. Where weight and space must be conserved actual stress distribution is more important than stress indicated by theoretical analysis.

In the new model polariscope of 4$^1/_4$" clear aperture, the parallel beam is collected by a rear element and condensed through a three component lens of the Cooke system. In the new larger unit (8$^1/_4$" aperture) a four component lens of the Omnar system is used. *The image is sharp throughout the field, free of aberration, astigmatism and distortion.*

Literature of new model polariscope now available

POLARIZING INSTRUMENT CO., Inc.
1819 Broadway, New York, N. Y.

** T. M. Reg. U. S. Pat. Off. Polaroid Corporation*



Every Ambitious Man in Industry Should Read this Free Booklet!

"FORGING AHEAD IN BUSINESS" contains FACTS for all thoughtful, forward-looking men; it has a message of particular interest to *technical men.*

This 64-page booklet, of which more than 3,000,000 copies have been circulated, outlines a definite plan of training for your future progress in industry.

Said one man who had sent for it:

"In thirty minutes this booklet gave me a clearer picture of my business future than I have ever had before."

Fill in the coupon below and this helpful manual will be sent to you by mail and without cost.

ALEXANDER HAMILTON INSTITUTE
Dept. 140, 73 W. 23rd Street., New York 10, N. Y.
In Canada, 54 Wellington St., West, Toronto, Ont.

Please mail me a copy of the 64-page book—"FORGING AHEAD IN BUSINESS."

Name..

Address...

Equipment Materials, and Methods

New Developments of Interest, as Reported by Manufacturers

Pressed Plates to 36 Feet

THE PRESSED PLATE facilities of Fort Pitt Bridge Works have been greatly expanded through the addition of a huge 36-ft hydraulic press which is fully described in a new bulletin just published. Plates can be pressed to accurate dimensions in one operation in any length up to 36 ft or even longer, states the company. In addition, a wide variety of special shapes can be pressed.

Fort Pitt's 36-ft hydraulic press eliminates many costly operations through its single-operation forming. Sections formerly built up by welding can now be designed and pressed from plates up to more than 6 ft × $^3/_4$ in. thick, producing an accurate, finished product. In addition, load carrying plates which formerly required stiffeners can be pressed into load carrying shapes with a saving in weight as well as in fabrication. Copies of the bulletin, "Pressed Plate Sections," may be secured from Fort Pitt Bridge Works, Pittsburgh, Pa.

Blind Heading Rivet

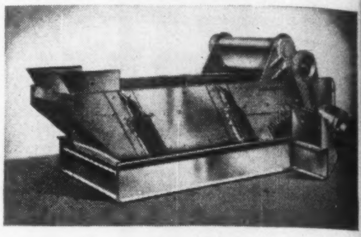
THE PATENTED RIVNUT of The B. F. Goodrich Company, Akron, Ohio, originally developed for aeronautical uses, is now available for a wide variety of industrial applications. The minimum priority requirement for industrial usage is AA-5.

The Rivnut is an internally threaded and counterbored tubular rivet which can be headed blind, made from one of the most corrosive-resistant practical aluminum alloys. Of one-piece construction, the Rivnut is anodized and ready for use when received. By the use of special tools, either manually or power operated, which the company also distributes, the Rivnut can be pulled up or headed while working entirely from one side, forming a bulge or head on the far side. This upset is large enough to resist being pulled through the metal, plastics or hard rubber to which the Rivnut is applied.

Installed, the Rivnut serves as a nut plate or rivet, or both. Two head styles, countersunk and flat, are offered, with the countersunk made in three shapes and the flat in one. Each is made in three nominal sizes, available in six grip ranges. They can be supplied with open or closed ends, and with or without keys under the head in all styles except the thin head countersunk type, where the key cannot be supplied. Manufacturers of air-conditioning units, panels, sheet metal articles, electrical equipment, shipbuilders, and telephone and telegraph systems can find excellent use for the Rivnut, the manufacturer's announcement says. A 12-page manual on the Rivnut, giving all details, including sizes, description of tools, and instructions for application is available upon request.

Vibrating Screen

THE IOWA MANUFACTURING Compan of Cedar Rapids, Iowa, has announced horizontal vibrating screen for stationar and portable gravel plants. The Cedarapids Horizontal Vibrating Screen is reported to be the first full-floating scree with no transmission of vibrations to th subframe and with directional vibratio forces that cannot become unbalanced The motor, driven by a V-belt drive an replaceable by a countershaft, if desired is mounted to one side of the frame on detachable platform.

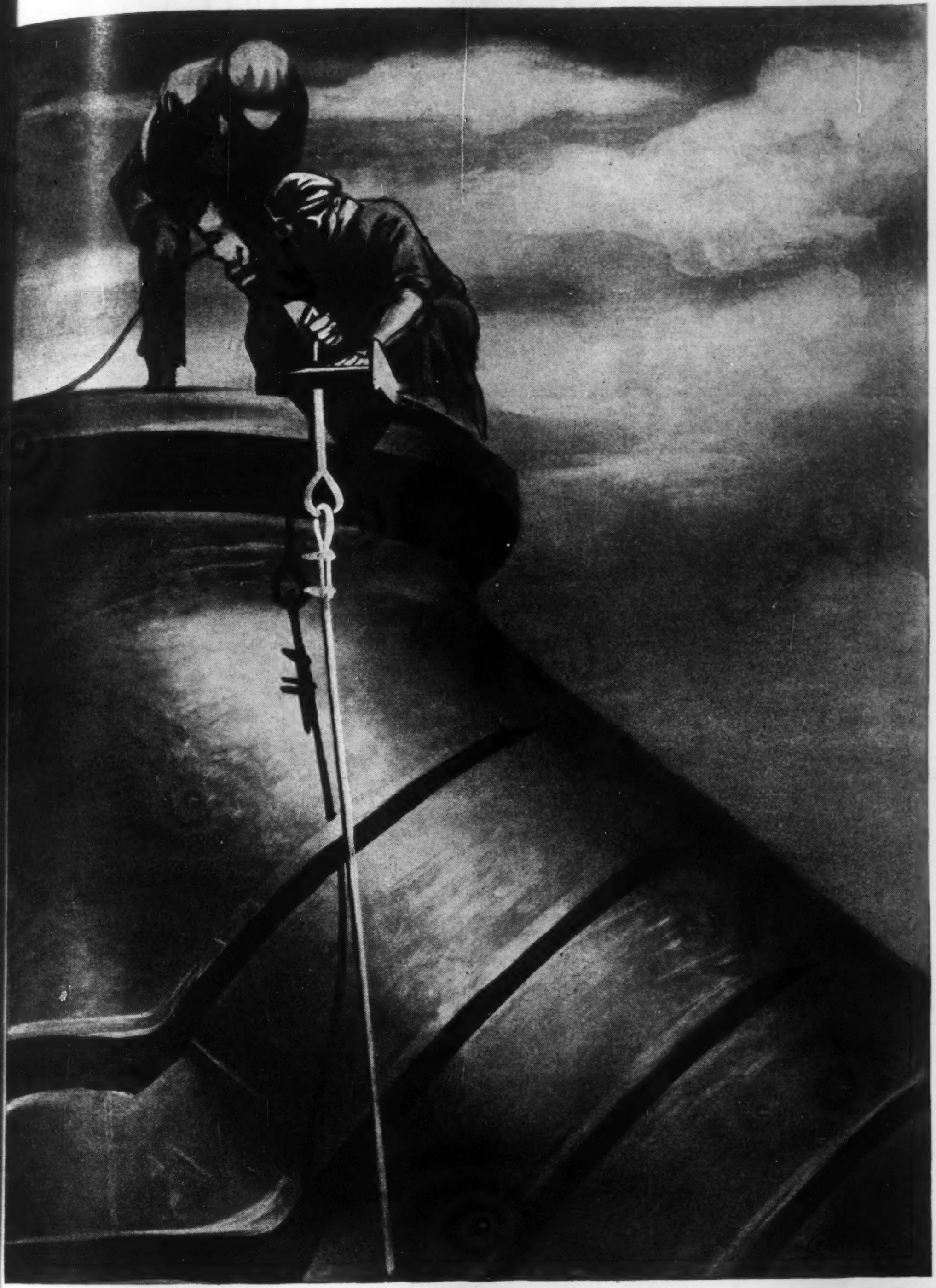


A number of advantages are claimed fo the screen. When installed on a portable plant, it gives complete access to either roll or jaw crusher by simply removing crusher hopper, and it reduces to a minimum the weight added by such an installation. It operates flat, moving the material by the action of the screen, thus affording more accurate control over the screening. Its construction allows the piling on of material without injury to the screen cloth, which means faster yield per hour, or in other words, more capacity. Other elements of convenience are the ease and simplicity of installing a new section of screen cloth or rearranging the combination of sizes, and the saving of headroom with this type of screen. Cedarapids Horizontal Vibrating Screens are available in a variety of sizes, single, double, or triple deck, ranging from 2 by 4 ft to 4 by 14 ft.

New Conveyor Belt

CONVEYOR OPERATION extending as far as six and one-half miles in a single belt, will be possible with Goodyear's new steel cable "compass" conveyor belts, announced by the Mechanical Goods Division of the Goodyear Tire and Rubber Company. Goodyear has conducted extensive tests with steel-cable belts during the past three years, and also has been producing steel-cable endless transmission belts since last fall.

The development of the steel-cable belt for moving coal and other bulk products came as a result of projects that required cotton-cord belt designs where the cords had to be as large as half an inch in diameter, Goodyear states, and metallurgical and manufacturing processes in the making of aeroplane cables had improved steel cables to the degree that



72-inch flanged Y-Branch weighing 17 tons being secured to special underslung car for rail shipment to a War Project. Drawn by Rico Lebrun for U. S. Pipe & Foundry Co.

Our facilities for producing fittings and castings in large sizes are adequate for any requirement. An experience of more than forty years in designing pipe and fittings, as well as special castings, for out-of-the-ordinary requirements, is at your service. Inquiries receive prompt attention and entail no obligation.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

CURRENT PERIODICAL LITERATUR

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Earth, Texas. Denison Dam—Ponton Bridge Aided Construction, C. R. Brown. *Western Construction News*, vol. 19, no. 3, Mar. 1944, pp. 63–66. Steel ponton bridge measuring 465 ft end to end, used to transport about 400,000 cu yd of material across river to aid in construction of dam.

Highway. Bridges on Alaska Highway, H. J. McKeever. *Roads & Streets*, vol. 87, no. 1, Jan. 1944, pp. 47–54. Brief description of construction of permanent bridges and rebuilt temporary structures, which formed major part of 1943 construction program on this road; illustrations given.

Military. Army Engineers Build 330-Ft Bridge in Three Hours. *Eng. & Contract. Rec.*, vol. 57, no. 8, Feb. 23, 1944, pp. 74–75. Article explains how U.S. Army Engineers constructed bridge of steel girders and rubber pontoons, which is capable of carrying heaviest mechanized equipment; illustrations given.

Pontoon. Bridge-Erecting Crane Trucks Speed Ponton Construction by Army Engineers. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 49, 98, 100. Brief description of methods involved in construction of bridge by use of trucks equipped with 4-ton capacity cranes.

Pontoon. Seabee Pontoons—for War and Postwar. *Eng. News-Rec.*, vol. 132, no. 16, Apr. 20, 1944, pp. 540–543. Steel pontoons, 5 by 7 ft in plan and 5 ft deep, fastened together rigidly in many combinations are being used for landing ramps, bridges, piers, barges, and drydocks; details of assembly and examples of use.

Widening. Concrete Bridge Deck Reinforced 100% with Scrap Rail. *Roads & Streets*, vol. 87, no. 1, Jan. 1944, pp. 84–86. Details of recent bridge-widening job, on Grapevine Creek in Kern County, Calif., in which deck was reinforced entirely with scrap rail; 80 tons of rail utilized in constructing three 67-ft 1-in., 2-lane deck-widening spans.

BUILDINGS

Apartment Houses, Design. Parklabrea Apartments. *Architect & Engr.*, vol. 156, no. 2, Feb. 1944, pp. 18–22, 28. Brief illustrated description of two-story buildings in private housing project of Metropolitan Life Insurance Co.

CITY AND REGIONAL PLANNING

California. California's Postwar Plans. *Western Construction News*, vol. 19, no. 3, Mar. 1944, p. 71–75. Postwar construction program of nearly $2,000,000,000 is indicated by tabulation of California projects.

Parks, Detroit, Mich. Metropolitan Parks for Detroit, G. Van Schaack. *Landscape Architecture*, vol. 34, no. 1, Oct. 1943, pp. 2–7. Large-scale, long-term plan to meet recreation needs is set forth; maps and illustrations given.

Postwar. Role of Transit in Community Planning, C. Gordon. *Eng. & Contract. Rec.*, vol. 57, no. 9, Mar. 1, 1944, pp. 19–21, 28. City and town planning is receiving increasing attention as major part of current postwar planning for reconstruction; radical remedies proposed; new traffic arteries, street widenings, and relocation, electric transit system changes, subways, etc., promise to provide considerable volume of work for Canada's construction industry. Before Empire Club of Toronto.

CONCRETE

Airport Runways. Runways with Ready-Mix. *Roads & Streets*, vol. 87, no. 1, Jan. 1944, pp. 43–46. Eight to eleven 7½-yd truck mixers helped place up to 4,200 sq yd of pavement per 8-hour shift on Woodbine, N.J., airport; notes on ready mix; illustrated description of methods and equipment used in carrying out this work.

Barges. Assembly Line Production of Concrete Barges. *Shipbldg. & Shipg. Rec.*, vol. 63, no. 13, Mar. 30, 1944, pp. 297–299 Notes on production of concrete barges in Great Britain; mass production from pre-cast slabs; 37 cargo barges in line and monthly turn-over; record of 74 working hours for a barge; illustrations.

Barges, Concrete-Steel. Light-Weight Concrete-Steel Barges Armored Against Hard Service. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 72–73, 100, and 102. Design, fabrication, and launching of barges in which form panels bolted tight against flanges of steel frame members confine light-weight concrete to space between frames, leaving flanges exposed to armor barge against abrasion on both outside and inside.

Construction. Job Problems and Practice. *Am. Concrete Inst.—J.*, vol. 15, no. 5, Apr. 1944, pp. 469–474. Following problems discussed: Tile Floor Exudes Sodium Silicate, P. H. Bates and R. F. Blanks; Warping of Concrete Slabs, L. W. Teller; Flexible Joints for Concrete Pipes and Troughs, M. W. Loving.

Cracking. Device for Determining Depth of Surface Cracks in Concrete, R. B. Young. *Am. Concrete Inst.—J.*, vol. 15, no. 5, Apr. 1944, pp. 401–406. Device is described consisting essentially of pressure tank, air pump, and pressure gage, together with pipes, valves, and fittings by which dye solution is forced into crack to be explored; then by drilling, crack is followed inward until it is bottomed; depth of crack is established by pressure test; some results obtained by means of using device are reported.

Gasoline Tanks. Concrete Gasoline Tanks for Military Use, E. R. Shepard. *Am. Concrete Inst.—J.*, vol. 15, no. 5, Apr. 1944, pp. 429–438. Number of tanks for bulk storage of aviation gasoline have been built of concrete, in which various methods of sealing tank against leakage of gasoline are being tested in endeavor to find satisfactory non-metallic tank; some results are discussed.

Mixing. Rapid and Simple Concrete Proportioning, L. D. Long. *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, pp. 426–429. Concrete proportioning by non-technical men in field can be carried out by means of four given charts; specific gravity of material to be tested and set of laboratory screens for determination of fineness modulus.

Products. War-Born Concrete Products, C. F. Moore. *Am. Concrete Inst.—J.*, vol. 15, no. 5, Apr. 1944, pp. 441–455. Over and above 200,000,000 odd concrete masonry units used in temporary war housing; 185 manufacturers in 35 states produced well over 3,000,000 pre-cast products of one kind or another during 1943; these products will in many instances carry on into peacetime production.

Railroad Ties. Pre-Stressed Concrete Sleepers, R. S. V. Barber. *Ry. Gaz.*, vol. 80, no. 6, Feb. 11, 1944, p. 139. Most recent development in pre-cast concrete manufacture is application of process of "prestressing" to production of reinforced concrete railway sleepers; process which has now been adapted to mass production is described.

Reinforcement, Standards. Specification for Twisted Reinforcement Bars. *Concrete & Constr. Eng.*, vol. 39, no. 2, Feb. 1944, p. 45. Abstract of British Standard Specification for cold twisted steel bars for concrete reinforcement.

Roads and Streets. Concrete Highways are Now "Wrapped in Cellophane." *Roads & Bridges*, vol. 82, no. 1, Jan. 1944, pp. 36–38, 68, 70. Canadian laboratory has started manufacture of colorless chemical film, or membranous coating, to prevent evaporation of moisture from newly poured concrete; although newly introduced to Canada, process is thoroughly proved as it has been used in increasingly large volume for past several years in United States; history of process; test results; advantages.

Roads and Streets. Developments in Concrete Pavement Construction, D. O. Robinson. *Eng. & Contract. Rec.*, vol. 57, no. 8, Feb. 23, 1944, pp. 69–71, 120. Brief description of recent changes and developments in design and construction of concrete pavement slab; for ro streets, and alleys, for airport runways, t strips and aprons, and for factory floors and dustrial roads and driveways.

Roads and Streets. Trends in Concr Paving as Exemplified by Road Constructi During Past Year, D. O. Robinson. *Roads Bridges*, vol. 82, no. 2, Feb. 1944, pp. 37–38, Paving practice, so far as use of portland ceme concrete is concerned, has continued to sh advancement in spite of limitations and restr tions of wartime; research; prevention of scali patching and resurfacing; curing methods; ru way paving.

Slabs, Design. Bond Stresses in Reinforc Cement Concrete Slabs, G. C. Khanna. *Indi Concrete J.*, vol. 17, no. 11, Nov. 1943, pp. 30 307. In culverts of small spans carrying hea loads, bond stress between steel and concre governs design of reinforced cement concre slabs; brief description of how bond stresses caused; formulas for use in design; example design calculations for reinforced cement co crete slab of 2-ft span; comparison of us method and method of G. S. Dunn as in *Concr & Constructional Engr.*, Jan. 1934.

Water Tanks and Towers. Prestress Concrete Water Tank for Connaugt Labor tories, U. of T. *Water & Sewage*, vol. 82, no. Feb. 1944, pp. 21, 54. 200,000-gal capacity tan which supplies storage water for laboratories a farm at University of Toronto, is of prestress design built in accordance with principles of pa ented preload systems; concrete is placed und constant compression stress in excess of all te sile stresses which may develop due to shrinkag plastic flow, temperature contraction, and h draulic loading.

CONSTRUCTION INDUSTRY

Military Engineering. Construction Persia, D. B. McKinley. *Construction Metho* vol. 26, no. 3, Mar. 1944, pp. 60–65, 157–160, 16 Construction of docks, camps, roads, and bridg for use of U. S. Army on supply route to Russ is described and illustrated.

DAMS

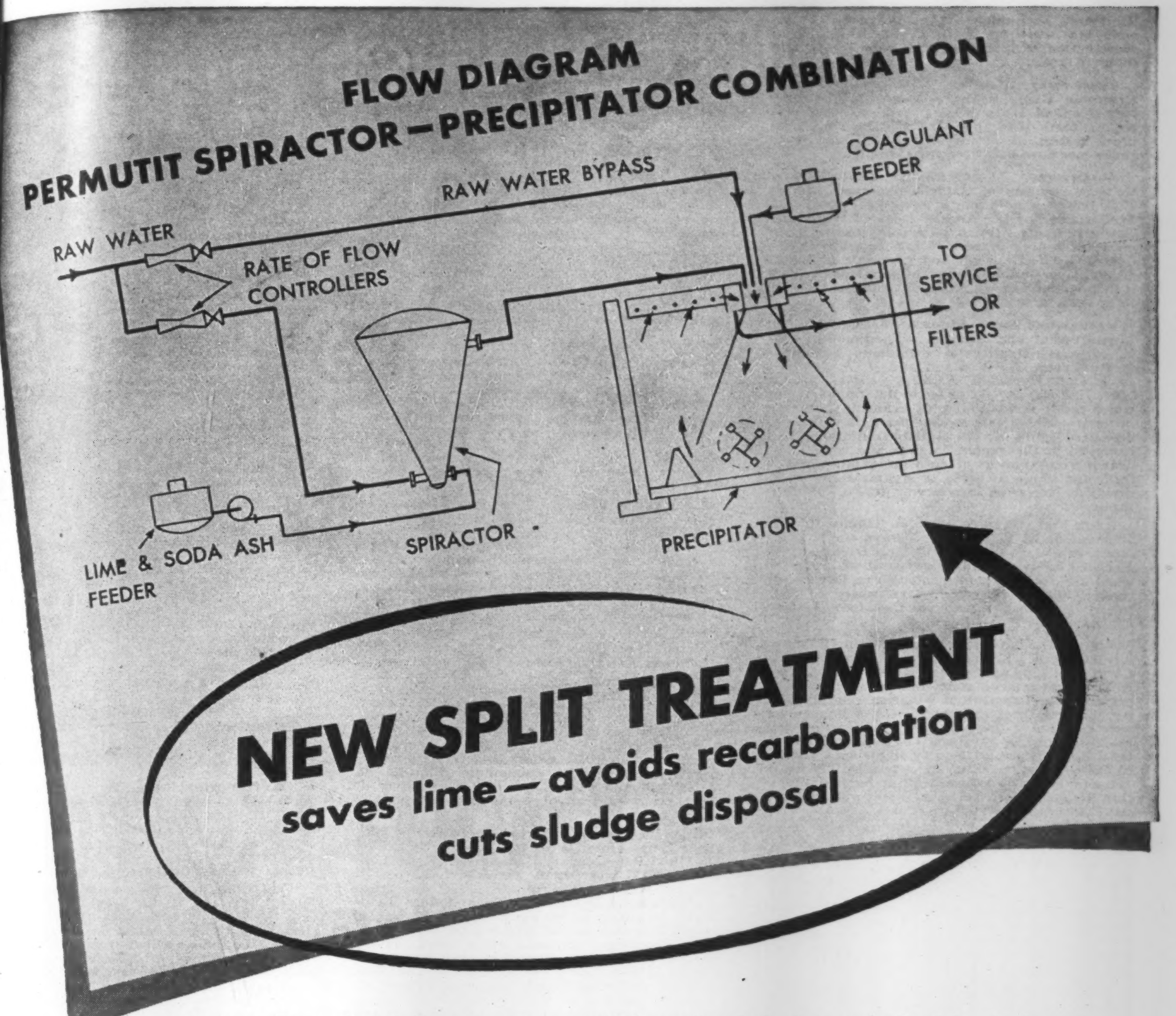
Concrete Gravity, Arkansas. Ice and R frigerated Water Reduce Concrete Temperatu at Norfork Dam. *Construction Methods*, vol. no. 3, Mar. 1944, pp. 86–87, 114, 116. Crush ice added to each batch; mixing water cooled refrigerating machine; cold water, chilled by frigerating plant in hot weather, circulat through cooling pipes installed on rock and on t of each lift in lower portions of structure.

Concrete, New South Wales. Warragam Dam. *Concrete & Constr. Eng.*, vol. 39, no. Feb. 1944, pp. 46–47. Report on design of da to be built to 342 ft above water level with rese voir capacity of 455 billion gal; type of constru tion still undecided.

Conveyors, Belt. Anderson Ranch Da Conveyor System. *Constructor*, vol. 36, no. Apr. 1944, pp. 38–39. Description of 2-mile-lo belt conveyor system which brings earth fro borrow pit to site of dam 1,193 ft below.

Earth, Failure. Estabilidad y Falla Presas de Tierra Cimentadas Sobre Capas Arcilla, K. Terzaghl. *Irrigacion en Mexico*, v 24, no. 4, July-Aug. 1943, pp. 175–181. Stabili and slip failure of earth dams resting upon be of clay; slip of homogeneous mass of soft cl occurs slowly; slip of stratified mass of cla divided horizontally by thin layers of mud fine sand, occurs suddenly in form of collaps without warning and of catastrophic character.

Hydraulic Gates. Preliminary Design Cha —XI: Vertical Lift Gate Selection, A. E. Nied hoff. *Western Construction News*, vol. 19, no. Feb. 1944, pp. 73–75. Charts and formula presented to aid in problem of application of v tical-lift crest gates; examples are given a effect of weight, cost, and discharge capacity design discussed.


FLOW DIAGRAM
PERMUTIT SPIRACTOR—PRECIPITATOR COMBINATION
RAW WATER BYPASS
COAGULANT FEEDER
RAW WATER
RATE OF FLOW CONTROLLERS
TO SERVICE OR FILTERS
LIME & SODA ASH FEEDER
SPIRACTOR
PRECIPITATOR
NEW SPLIT TREATMENT
saves lime—avoids recarbonation
cuts sludge disposal

The new Permutit* "Spiractor" opens up interesting new possibilities in the treatment of municipal water supplies. The "Spiractor" is ideal for removal of calcium because it requires small space and low investment and because it minimizes the need for sludge disposal. Precipitates are removed by plating out on the catalyst granules, rather than as a dilute sludge.

For magnesium removal, the "Spiractor"—Precipitator combination is indicated. Utilizing the best features of both types of equipment, the calcium is removed in the "Spiractor" and the magnesium in the Precipitator. Where magnesium hardness must be reduced below 5 grains per gallon, split treatment as shown in the diagram is advisable. The major portion of the hard water is treated with all the lime and soda ash in the first stage ("Spiractor"). It is then neutralized by the bypassed raw water and coagulated in the second stage (Precipitator). This means a saving in lime and soda ash equivalent to the causticity (hydroxide alkalinity) which would normally be needed in one-stage treatment to obtain the same magnesium in the effluent.

Split treatment also eliminates recarbonation. Effluent of the second stage is stable and contains no causticity, so that water is of low enough pH value to go directly to the distribution system.

Existing lime soda plants can often be modernized advantageously by adding the "Spiractor" as a first stage. Write for full details to The Permutit Company, Dept. A14, 330 W. 42nd St., New York 18, N. Y. In Canada: Permutit Company of Canada, Ltd., Montreal. *Trademark Reg. U. S. Pat. Off.

PERMUTIT

BETTER WATER
MEANS HAPPIER CITIES
. . . Plan it NOW!

WATER CONDITIONING HEADQUARTERS

Reservoirs, Construction. Construction of Tanks and Reservoirs, K. Holden. *Water & Sewage*, vol. 82, no. 3, Mar. 1944, pp. 24–26, 45–46. Principles of construction of reservoirs and wood, steel, and concrete tanks.

Reservoirs, Failure. Failure of Lower Reservoir Dam, Belfast, Maine, J. E. Hale. *New England Water Works Assn.—J.*, vol. 58, no. 1, Mar. 1944, pp. 69–73. Description of break in dam, which was built in 1887, and emergency measures used to restore supply.

Reservoirs, Maintenance and Repair. Cement Painting of Asphalt Reservoir Lining. *Pub. Works*, vol. 75, no. 4, Apr. 1944, pp. 30, 32. Method used by Los Angeles Dept. of Water and Power in lining Elysian Reservoir, storage basin of water supply system of Los Angeles, Calif.; damaging effects of silt and vegetable film that accumulates on lining, prevented by spraying on it thin coat of cement, containing calcium chloride to prolong its drying.

Reservoirs, Silt. Study of Methods Used in Measurement and Analysis of Sediment Loads in Streams—Density of Sediments Deposited in Reservoirs, E. W. Land and V. A. Koelzer. *Iowa Inst. Hydraulic Research—Report No. 9*, Nov. 1943, 60 pp. In order to determine rate at which reservoirs will fill with sediment it is often necessary to estimate weight per unit volume of deposited sediment; all available data have been compiled in this report; results and conclusions drawn from analysis of data are summarized in form applicable to needs of organizations or individuals interested in reservoir design. Bibliography.

Rock Fill, Oregon. Oregon Timber Dam Is Renovated, H. I. Taylor. *Western Construction News*, vol. 19, no. 3, Mar. 1944, pp. 80–81 and 96. Decayed spillway timbers replaced with treated wood and rock fill, constructed to replace failing timber abutment, have added estimated 25 years to old rock-filled timber crib Cazadero Dam on Clackamas River, Oregon.

Weirs, Discharge. Weir Flow in Overflowing Tanks, K. Kammermeyer. *Indus. & Eng. Chem.*, vol. 36, no. 3, Mar. 1944, pp. 202–204. Analysis of data on weirs flowing at low heads permits establishment of equation relating flow per unit length of weir with head of liquid over weir by straight-line relation; equation for weir heads up to 0.03 ft; from 0.03 to about 1 ft of head curve can be fitted to available data, similar to Francis weir formula; data on tank 0.35 in. in diameter at very low heads fall in line with literature data; data are for flow of water but should serve for many dilute solutions. Before Am. Chem. Soc.

FLOOD CONTROL

Cincinnati, Ohio. Giant Pump Station Gives Two-Way Flood Protection. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 62–65, 142. Description of pump station, consisting of nine pumps with total capacity of 13,500 cu ft per sec against 29-ft static head, used in protection against Ohio River backwater.

FOUNDATIONS

Design. Design of Foundations for Elevated Towers, S. Garnett. *Petroleum Refiner*, vol. 23, no. 2, Feb. 1944, pp. 46–54. Paper deals with design of reinforced-concrete frame foundation for tower where elevation of bottom of tower is 15 ft or more above grade; example of calculation for typical design.

Piles, Driving. Two-Crane Team Drives Long Batter Piles. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 56 and 132. Coordination of two cranes dispenses with hammer leads in driving long batter piles to support bridge abutments of grade-separation structures on Detroit Industrial Expressway.

HYDROELECTRIC POWER PLANTS

Liberia. American Engineers Build Power Dam in Liberia. *Eng. News-Rec.*, vol. 132, no. 10, Mar. 9, 1944, pp. 336–338. Hydroelectric project, constructed almost entirely by hand labor, consisted of diversion dam, intake and headworks, side channel spillway, open canal, steel penstocks, and powerhouse.

Penstocks, Steel. Field Welding of Steel Penstocks and Tunnel Liners, L. G. Christofferson. *Welding J.*, vol. 23, no. 3, Mar. 1944, pp. 233–237. In erecting penstocks, tunnel liners, surge tanks, and risers on hydroelectric power plants, welding problems are of very special nature and require widely varying procedures and equipment; author has been directly connected with erection of nine such projects and views; statements and conclusions presented are based on his experiences on these various projects. Before Am. Welding Soc.

HYDROLOGY AND METEOROLOGY

Soils, Erosion. Two Devices for Measuring Soil Erosion, W. D. Ellison. *Agric. Eng.*, vol. 25, no. 2, Feb. 1944, pp. 53 and 55. Illustrated description of two devices constructed by author—splash sampler used in collecting sample from splash of raindrops, and flow sampler used in sampling surface flow; it is not author's idea that devices described should replace other instruments used to measure soil erosion, but rather that they should be used in addition to other devices.

IRRIGATION

Irrigation Canals, Concrete Lining. Gunite Canal to End Seepage, L. L. Lee. *Western Construction News*, vol. 19, no. 3, Mar. 1944, pp. 69–70. Gunite lining on banks of Arizona Canal of Salt River Valley Water Users Assn., shaped to 1-to-1 slope with dredger; ready-mix concrete placed on bottom.

LAND RECLAMATION AND DRAINAGE

Culverts. This County Is Eliminating Bridges, F. C. Frear. *Better Roads*, vol. 14, no. 3, Mar. 1944, pp. 29–30. Brief description of systematic plan followed by Douglas County, Oregon, in which inadequate structures are replaced with culverts and fills; normal methods in suspension during war.

Roads and Streets. Drainage and Street Construction on War Housing Project in Virginia, H. W. Alexander. *Highway Mag.*, vol. 35, Jan.-Feb. 1944, pp. 7–10. Article deals only with surface drainage and roadway design of housing project.

MATERIALS TESTING

Elasticity. Method for Estimating Shear Modulus of Elasticity, L. E. Welch. *Product Eng.*, vol. 15, no. 3, Mar. 1944, pp. 215–216. By means of "rule of thumb" method, shear modulus of elasticity of any material of construction can be estimated with fair accuracy from its tensile or its compressive modulus of elasticity which are essentially equal, and designated as modulus of elasticity; equations and graphs given.

Highway Research. Road Research in Wartime. *Roads & Road Construction*, vol. 22, nos. 253, 254, Jan. 1, 1944, pp. 10–12, Feb. 1, pp. 52–54. General outline of work carried out at Dept. of Scientific and Industrial Research, Road Research Laboratory: Soils and earthworks; aggregates; concrete; bituminous surfacings; surface characteristics; mobile laboratories; lecture courses; library and information service; publications.

Road Materials, Analysis. Determination of Cement Content of Soil-Cement Mixtures, J. Mizroch. *Pub. Roads*, vol. 23, no. 11, Jan.-Feb.-Mar. 1944, pp. 297–299. Results of Investigations made by Division of Tests, Public Roads Administration; samples of soil, soil cement, and cement are treated with hydrochloric acid, insoluble residue is filtered off, and calcium is precipitated and determined in filtrate after sufficiently buffering with ammonium chloride and acetic acid and adjusting solution to pH of 4; preparation of reagent solutions; method of analysis.

Road Materials, Concrete. Effect of Tar, Ammonium Fluosilicate, and Sodium Hydroxide on Alkali Resistance of Concrete, E. C. E. Lord and D. G. Runner. *Pub. Roads*, vol. 23, no. 11, Jan.-Feb.-Mar. 1944, pp. 282–296. Investigations made by Division of Tests, Public Roads Administration, on concrete specimens having water cement ratios of 0.7 and 0.8 by volume; aggregates were Potomac River sand having fineness modulus of about 2.65 and gravel containing 50% of $^{3}/_{4}$ to $^{1}/_{2}$-in. size and 50% of $^{1}/_{2}$-in. to No. 4 size; two brands of cement passing all standard specification requirements were used in preparing specimens; results of physical and chemical tests on cements.

Roads and Streets. Asphaltic Concrete Tank Testing Track. *Roads & Streets*, vol. 87, no. 2, Feb. 1944, pp. 77–78, 80–81. Notes on design of pavement at Ford Highland Park tank arsenal, preliminary wear test, and condition after 35,000 miles of tank operation.

Welded Steel Structures, Design. Report of Tests of Welded Top-Plate and Seat Building Connections. J. L. Brandes and R. M. Mains. *Welding J.*, vol. 23, no. 3, Mar. 1944, pp. 146-s–165-s. Consideration of design of top plates to be used as parts of beam-to-column connections in buildings; total of 17 specimens were tested, 11 intended to be of "semi-rigid" type and 6 of "flexible" type to determine structural behavior of some promising types of top-plate details.

PORTS AND MARITIME STRUCTURES

Auxiliary. Planning of Auxiliary Ports, E. Latham. *Engineering*, vol. 156, no. 4066, Dec. 17, 1944, pp. 481–483. Term "auxiliary port" is intended to indicate class of harbor, wharf, or jetty which, apart from those forming part of big docks, are included as part of equipment of industrial undertakings such as oil wharves, cement or paper mills, and factories.

Seaplane Bases. Notes on Seaplane Harbours. *Dock & Harbour Authority*, vol. 24, no. 278, Dec. 1943, p. 184. Provision of harbor accommodation for seaplanes is likely to become important problem in postwar development; essential characteristics; wartime experience; landing facilities; influence of water channel.

PUBLIC WORKS ENGINEERING

Arizona. Postwar Plans for Arizona. *Western Construction News*, vol. 19, no. 2, Feb. 1944, pp. 67–68. Projects in actual planning stage are briefly reviewed; Bureau of Reclamation, building and highway programs are given.

ROADS AND STREETS

Access. Notes on Utah's Access Roads, L. A. Blackner. *Roads & Streets*, vol. 87, no. 3, Mar. 1944, pp. 56–59. Methods and design details typical projects in state's recent $9,000,000 p gram.

Airports, Construction. Fighting Time Elements at Madras Airport. *Pac. Bldr. & E* vol. 50, no. 4, Apr. 1944, pp. 48, 52, 54, 56, 58. Details pertaining to construction of air at Madras, Ore.; rock excavation; blast ditches; earth excavation; pairing; draina cinder stabilization; light ducts; labor supp transportation facilities.

Airports, Construction. Army Airfield Tests Contractor's Transport Service. *Constr tion Methods*, vol. 26, no. 3, Mar. 1944, pp. 66 126. Illustrated description of equipment, conditions, pavement joints, and paving ope tions in extension of airfield near Newburgh, N.

Airport Runways. 170-Machine Grad Outfit Whipped Six-Million-Yd. Airport J H. J. McKeever. *Roads & Streets*, vol. 87, no. Mar. 1944, pp. 49–54. Details pertaining to c struction of Moon Township Airport, Pi burgh, Pa., which required 6,000,000 cu yd excavation to level for standard 3-runway l out; under 10 to 20 ft of scraper dirt lay hardp limestone, and shale, plus 300,000 cu yd of c and "crop"; general grading strategy; how were widened for taxiways; rock excavati subdrainage; black top paving.

Asphalt. Emulsified Asphalt Pavement, M. Hands. *Western Construction News*, vol. no. 2, Feb. 1944, pp. 65–66. Experiences Oakland, Calif., with use of asphalt in emulsif form for street paving; specifications develop from experience with different types of soils a equipment.

Bituminous. Scoreboard for Bitumino Roads, G. F. Swatek. *Better Roads*, vol. 14, 1, Jan. 1944, pp. 18–21, 31–32. Description rating system used by Nebraska Department Roads and Irrigation, which provides informati for efficient use of maintenance forces and orde planning of future reconstruction and secon stage improvement of entire state bitumino system; field procedure is simple, but yiel sufficient detail.

Construction. 4,300-Ft. Access Street Elev tion Speeds Seattle War Effort, G. H. Shear *Roads & Streets*, vol. 87, no. 2, Feb. 1944, pp. 5 55. Constructional details of Spokane Aven overcrossing designed by city of Seattle, Was and built under direction of Washington Sta Department of Highways; general desi features.

Construction. Building to Reduce Mainte nance, C. L. Motl. *Better Roads*, vol. 14, no. Feb. 1944, pp. 23–24, 36, 38. Suggestions give which should aid in modifying maintenance e penditures; design of roadway; drainage faci ties; traffic aids and control; roadside improve ment; postwar outlook.

Construction. Roads and Their Utility i Naval Warfare, B. M. French. *Highway Ma* vol. 35, Jan.-Feb. 1944, pp. 4–6. Shore esta lishment of Navy, which is designed solely t make Navy afloat and aloft more effective again enemy, has grown with fleet; growth has bee dependent, to large degree, upon highways, street and roads for necessary transportation; note on methods and equipment used by Constructio Battalions of Navy.

Design. Measuring Limited Sight Distanc W. A. McCree. *Better Roads*, vol. 14, no. Feb. 1944, pp. 27–29. Description of method de veloped by Illinois Division of Highways whic gives location, length, cause, and mileage of roa involved with relatively high degree of accurac

Design. Relation Between Right of Way an Freeway Design in Metropolitan Areas, F. Grumm. *Calif. Highways & Pub. Works*, vol. 2 nos. 1, 2, Jan.-Feb., 1944, pp. 5–7, 18. Right-o way relations incidental to developing plans fo economical and consistent costs without viola ing principles of present highway design are dis cussed; number and width of freeway lane outer highways; median strips; accelerati and decelerating lanes; intersection treatment border treatment and slope requirement. Befor Road Design Committee of Am. Assn. of Stat Highway Officials.

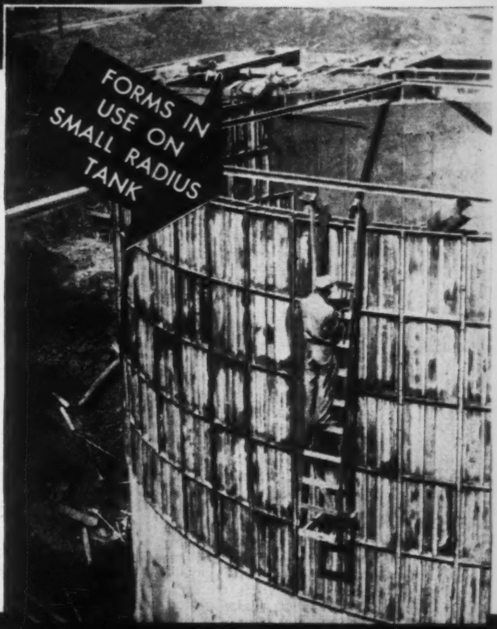
Design. Sight Distances for Highways, H Criswell. *Roads & Road Construction*, vol. 2 nos. 250, 251, and 252, Oct. 1, 1943, pp. 275–278 Nov. 1, pp. 305–308, Dec. 1, pp. 339–342; vol. 2 no. 253, Jan. 1, 1944, pp. 5–7. American polic reviewed in light of English practice; article dis cusses pamphlet, "Policy on Sight Distance fo Highways," published by American Assn. o State Highway Officials; principles of America policy; definition of sight distance.

Embankments. Mississippi Finds Kudz Effective Cover for Highway Slopes, A. W Susott. *Roads & Streets*, vol. 87, no. 1, Jan 1944, pp. 62, 64. Use of kudzu in highway ero sion-control work; work of maintaining stee road banks along Mississippi's paved highwa system has been simplified through use of kudzu oriental legume, whose runners grow from 2 to 50 ft in single season; method now followed in establishing kudzu on slopes of highway cuts.

Expressways and Parkways, Detroit Michigan Builds Expressway Costing $2,000,00 a Mile. *Construction Methods*, vol. 26, no. 4 Apr. 1944, pp. 52–54, 116, 118, 120, 122, 124, 126 128, 130, and 132. Problems involved and

ANSWERS TO YOUR FORM PROBLEMS of lumber and labor

BASE FOR NEXT FORMS
FORMS READY FOR POURING
BREAKING BACK FORM TIES
STRIPPING FORMS
CLEANING FORMS FOR RE-USE
FORMS FOR HEAVY MACHINERY FOUNDATIONS


FORMS IN USE ON SMALL RADIUS TANK

USE AND RE-USE UNI-FORMS

TO HELP IN WARTIME SAVING OF LUMBER

Because Uni-Forms are available on either a rental or purchase basis and are re-usable, they provide a real answer to the lumber shortage. Uni-Forms are lined and braced on one side only using a minimum of lumber for this purpose. Since Uni-Forms are simple to erect, one man can do the work of two and thus help overcome the manpower shortage. Uni-Forms are maintained in stock at strategic locations throughout the country. We will be glad to supply estimated Uni-Form use costs for bidding purposes or supply a catalog on request.

FORMS IN POSITION FOR BATTERED WALL
LINING AND BRACING ONE SIDE ONLY

Universal FORM CLAMP CO.

methods used in construction of 5.8-mile extension of Detroit Industrial Expressway; soil conditions, grading, and paving, and bridge construction are discussed.

Flight Strips. Aurora Flight Strip, H. H. Edwards. *Pac. Bldr. & Engr.*, vol. 50, no. 3, Mar. 1944, pp. 32–35. Details of construction of Aurora Flight Strip near Aurora, Ore., which is 8,084 ft long, and has one asphaltic concrete runway 4,100 ft long and 150 ft wide, flanked on each side by 75-ft shoulder of penetration macadam.

Guard Rails. Right-of-Way Widths and Markings and Use of Guard Rails by Counties. *Pub. Works*, vol. 75, no. 1, Jan. 1944, pp. 23–24, 26. Data concerning county roads in 750 counties; widths of right-of-way, and how limits are marked; kinds of guard rail used and mileage in several counties.

Highway Administration, Economics. Highway Land Acquisition Costs and Practices, D. R. Levin. *Pub. Works*, vol. 75, no. 2, Feb. 1944, pp. 21–22, 30. Results of study by Public Roads Administration of right-of-way costs of Three-State Highway, and difficulties encountered in acquiring land in rural, suburban, and urban areas.

Highway Systems, India. Road Plan for India—III, R. B. Phayre. *Indian Concrete J.*, vol. 17, no. 11, Nov. 1943, pp. 320–321. Third of series of eight prize-winning entries in competition conducted by Indian Roads and Transport Development Assn. Ltd.

Highway Systems, Location. Reconnaissance for Road Location, S. D. Stables. *Commonwealth Engr.*, vol. 31, no. 7, Feb. 1, 1944, pp. 169–171. Method of approach to problem of road location which is of wide application is described; this consists essentially in making initial assumption that straight-line location is practicable and gradually modifying this in light of further knowledge.

Highway Systems, Pennsylvania. Philadelphia Industrial Highway. *Roads & Streets*, vol. 87, no. 2, Feb. 1944, pp. 41–44. Eleven contracts for 14 miles of heavy-duty divided roadway completed by state in 1943; work ties in with state's $43,000,000 postwar highway development program for Philadelphia; features of roadway design; concrete-slab design; vinsol resin concrete; extensive subdrainage; notes on construction; illustrations showing steps taken in placement of white cement reflecting plane curb; brief commentary on postwar projects.

Highway Systems, Planning. Main Routes for Tomorrow. *Better Roads*, vol. 14, no. 2, Feb. 1944, pp. 17–20, 30–31. Limited network of recommended interregional arteries outlined by committee of specialists in highways and planning as guide for main line highway activities of states and cities; expenditure of $750,000,000 annually on system in period after war advocated. Extracts from report by National Interregional Highway Committee transmitted to Public Works Administrator, P. B. Fleming, for submission to President Roosevelt.

Highway Systems, Postwar. California Will Be Ready for Work, G. T. McCoy. *Better Roads*, vol. 14, no. 1, Jan. 1944, pp. 29–31. State divisions of highways and counties alike are planning programs of postwar work with aid of legislative appropriations; extensive construction will be needed to rehabilitate state's war-worn roads.

Highway Systems, Postwar. Future Highway Program, T. H. MacDonald. *Am. Highways*, vol. 23, no. 1, Jan. 1944, pp. 26–29. Broad discussion of postwar highway reconstruction program; deterioration of highways and bridges caused by increased frequency of use by heavier units, and curtailment of replacements and adequate repairs too drastic for anything but all-out war conditions, present currently most acute problem.

Highway Systems, Postwar. Preparing for Postwar Highway Program, T. H. McDonald. *Constructor*, vol. 26, no. 3, Mar. 1944, pp. 39–42. Consideration of preparedness of construction industry to absorb quickly and place under way immediately large construction program. Before Associated General Contractors of America.

Maintenance and Repair. Big Road Upkeep Job Ahead in '44. *Roads and Streets*, vol. 87, nos 1 and 2, Jan. 1944, pp. 55–57, 60 and Feb., pp. 74–76. Reports from various state highway departments on arterial road conditions, outlook for needed repairs and resurfacing, and special maintenance problems.

Maintenance and Repair. Maintenance by Contract, C. M. Hathaway. *Construction Adviser*, vol. 16, no. 2, Feb. 1944, pp. 23–26, 28. Description of emergency methods of patching and resurfacing employed in Illinois in order to keep roads under repair; patching work, with certain amount of resurfacing, was grouped into convenient sections and put up for contract letting; survey is made of each project in spring, and proposed patch is outlined in paint for information of bidder and future use of resident engineer. Before Associated General Contractors of Missouri.

Maintenance and Repair. Minimum Roadside Maintenance, F. A. Aust. *Better Roads*, vol. 14, no. 3, Mar. 1944, pp. 18–19. Brief note on road maintenance in wartime; in gearing maintenance programs to prevailing conditions of wartime scarcity, prudent highway administrators will be careful not to cut roadside operations to point where hazards are created and loss or impairment of investments in highway improvements is threatened.

Maintenance and Repair. Old Concrete Highway Pavements Salvaged, M. Whitton and J. D. Chadwick. *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, pp. 416–419. Description of methods used in Missouri to eliminate free water under concrete slab; voids filled with slurry of soil and cement delivered by hose mounted on rollers.

Maintenance and Repair. Maintenance of Shoulders and Ditches on Secondary Roads, LaV. A. Kohn. *Pub. Works*, vol. 75, no. 3, Mar. 1944, pp. 14–17. Article explains how Dodge County is restoring to good condition 400 miles of gravel road; metal was almost gone, and ditches and culverts were closed with dirt; old gravel was salvaged and used, and grades and drainage improved.

Maintenance and Repair. Patching High-Type Flexible Pavements. *Roads & Streets*, vol. 87, no. 3, Mar. 1944, pp. 60, 62, 64, 66–68. Suggested procedure outlined; preparing old surface; paint patching; patching with premixed material; patching mixtures; methods of making patching mixtures; patching with road mix; cold weather patching. Section I of subcommittee report, "Salvaging Old High-Type Flexible Pavements," submitted at Highway Research Board meeting.

Maintenance and Repair. Patching Pavements with Soil-Cement, W. V. Baise. *Roads & Streets*, vol. 87, no. 2, Feb. 1944, pp. 56, 58. Article explains how North Carolina State Highway and Public Works Commission has used soil cement on various road types since 1939; illustrations given.

Maintenance and Repair. Premix for Wartime Patches, M. C. Methvin. *Better Roads*, vol. 14, no. 2, Feb. 1944, pp. 29–30. Arkansas Highway Department mixes bituminous patch material in portable plants for augmented repair program; excessive loads have accelerated surface damage; in design of premix manufactured and hauled direct and placed on roadway, RC-2 and RC-3 asphalt was used; MC-3 asphalt is used for stock-piled material; brief note on equipment used.

Maintenance and Repair. Resurfacing Old Pavements with Asphaltic Concrete. J. G. Schaub and T. Humphries. *Roads & Bridges*, vol. 82, no. 3, Mar. 1944, pp. 63–67, 104, 106, 108. Details of methods followed by Michigan State Highway Dept. in rehabilitation of old pavements. Before Assn. Asphalt Paving Technologists.

Maintenance and Repair. Road-Life Data and Other Factors in Postwar Programs, F. B. Farrell. *Better Roads*, vol. 14, no. 3, Mar. 1944, pp. 23–24. Awareness of significance of data on life characteristics of highway components is necessary to produce maximum yield from investment in highway plant; war has brought opportunity to observe performance of highway system under conditions of most severe stress in its history. Condensation of paper before Highway Research Board.

Maintenance and Repair. Wartime Maintenance and Repair for Asphalt Road Surfaces, C. L. Shattuck. *Eng. & Contract. Rec.*, vol. 57, no. 8, Feb. 23, 1944, pp. 66–68. Techniques developed by City of Detroit, Mich., frost heaves, damaged gutters, and utility service cuts described. Before Assn. Asphalt Paving Technologists.

Pasadena, Calif. Pasadena, California, Water Department. *Pub. Works*, vol. 75, no. 2, Feb. 1944, pp. 17, 40–41. Supplies obtained from 20 sources are distributed to 86,500 customers; system includes 12 reservoirs and 23 pumping stations; plans have been made and reserve funds are in hand for large amount of postwar construction; diagram showing pumping plants, reservoirs, and principal distributing mains of Pasadena Water Dept. is given.

Postwar. Postwar Planning for Ontario County and Township Roads, J. A. P. Marshall. *Eng. & Contract. Rec.*, vol. 57, no. 13, Mar. 29, 1944, pp. 14–16, 34–35. Municipal roads branch has completed survey of needed work on country roads and bridges; nature of postwar work; catching up maintenance; summary of counties; townships; reserve funds; financial position of counties; postwar financing on part of municipalities. Before Ontario Good Roads Assn.

Road Materials, Rubber. Two Inches of Rubber, C. Ridley. *Passenger Transport J.*, vol. 90, no. 2279, Mar. 10, 1944, pp. 153–155. Possibilities for use of synthetic rubber as road material after the war, are discussed; effects of road surface with 2 in. of shock preventing or absorbing properties would have incalculable results on design and weight reduction of vehicles using roads.

Transportation, Postwar. Transportation for Tomorrow, J. Randolph. *Am. Highways*, vol. 23, no. 1, Jan. 1944, pp. 23–25. Brief discussion of postwar transportation; highway and airport construction needed.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. New Central Control at Milwaukee Sewage Treatment Plant, C. G. Richardson and J. A. Maiers. *Water Works & Sewerage*, vol. 91, no. 3, Mar. 1944, pp. 99–1 Description of new central control system facilitate closer proportioning of return sludge raw sewage.

Canada. Postwar Prospects for Sewerage Canada, A. E. Berry. *Water & Sewage*, vol. no. 3, Mar. 1944, pp. 20–22, 47–48, 50. Survey recent developments and outlook for postw period. Abstract of paper before N.Y. St Sewage Works Assn.

Canada. Postwar Sewage Disposal Prosp in Canada. *Eng. News-Rec.*, vol. 132, no. Mar. 9, 1944, pp. 348–350. Review of develo ments and prospects in sewerage, and sewa treatment.

Gas Recovery. From Sewage-Disposal D gester Gas Come Power and Heat for Pla Operation. *Power*, vol. 88, no. 3, Mar. 1944, p 144–147, 202a–c. New York City's Bowe Bay sludge treatment works at Astoria, Long I land, with 40-mgd treating capacity, uses two 8 hp digester-gas engines connected to 560 kw a generators; complete list of principal powe pumping, and compressed air equipment is give

Missouri Conference. Missouri Conferen Impressive. *Water Works & Sewerage*, vol. 9 no. 2, Feb. 1944, pp. 57–62. Summary of Wat and Sewerage Conference in Jefferson City, O 25–26. Papers included: Operation and Beaut fication of Vandalia Treatment Plants, A. Litt and H. Brown; Effects of Pollution on Strea Biology, P. Barnickal; Operating Separate Slud Digestion Units, H. E. Schlenz; War Situation Chemicals, O. A. Collins; Chlorinating Equi ment Situation, R. Pratt; O. W. U. Orders a Other WPB Restrictions, V. Weir and H. Stephe son.

Modern Trends. Trends in Sewage Trea ment, P. Hansen. *Sewage Works Eng., & Mu Sanitation*, vol. 15, no. 3, Mar. 1944, pp. 134–13 Brief discussion of trends, such as extensive use mechanical equipment, high-rate trickling filter two-stage treatment, chlorine, finishing filter etc.

Recent Developments. Developments Year in Sewerage and Industrial Wastes, A. Rawn. *Water Works & Sewerage*, vol. 91, no. Feb. 1944, pp. 39–48. Survey of developmen including sewage plant construction, manpow outlook, materials situation, research, industri wastes, activated sludge and high rate filtratio sludge digestion, gas engines, equipment, a disease transmission.

Sewers, Construction. Building Intercepto Sewer for St. Charles, Missouri, R. W. Halteman *Pub. Works*, vol. 75, no. 2, Feb. 1944, pp. 11–1 20, 28. Removing sanitary sewage to outlet be low city; how work was prosecuted in close quar ters with intermittent rain and floods for over tw months; constructional details given; illustra tions.

Sewers, Construction. Lake Forest Sew Survey and Construction of Relief Sewers, N. N Campbell. *Pub. Works*, vol. 75, no. 1, Jan. 194 pp. 13–16. Comprehensive survey of sewer sys tem of city of Lake Forest, Ill.; detailed descrip tion of procedure of calculating sizes, grades, etc of both sanitary and storm sewers to relieve an replace outgrown system; construction features

Sewers, Design. Trends in Sewer Design W. L. Malcolm. *Water & Sewage*, vol. 82, no. 2 Feb. 1944, pp. 22–24, 45–52, 54. Review o trends being followed in United States in design o domestic and storm sewers, as indicated by replie to author's questionnaire. Bibliography. Befor Can. Inst. on Sewage & Sanitation.

Sludge Dewatering. Sludge Dewatering by Porteous Process. *Water & Sewage*, vol. 82, no 2, Feb. 1944, pp. 17–20, 38. Salient features and sequence of operations of process which depends on steam heating sludge to about 360 F for shor period, whereby gel structure is so altered and hydration and water affinity of solids so reduced that bulk of aqueous content can be subsequently separated by simple settlement and decantation and thickened residue rapidly and easily dewatered by filter pressing methods.

Sludge Digestion. Effect of Dilution o Sludge Formed by Neutralizing Acid Waste with Lime, W. Rudolfs and W. Rudolfs, Jr *Pub. Works*, vol. 75, no. 2, Feb. 1944, pp. 24–26 28. Results from experiments conducted to learn type of alkali best suited for neutralization, quantities of sludge produced, and effect of dilution o waste.

South America. Sewage Disposal Prospects in South America, E. J. Cleary. *Sewage Works J.* vol. 16, no. 1, Jan. 1944, pp. 121–123. Sewage treatment works are not immediate need in South America since more elementary facilities have not yet been developed to necessary scale several reasons for lack of prospects for North American engineering and consulting service.

Treatment Plants, Elizabeth, N. J. Sewerage Craftsmanship. *Am. City*, vol. 59, no. 2 Feb. 1944, pp. 56–58. Illustrated description of joint sewage treatment plant, which serves eleven New Jersey communities and is located at Elizabeth, N.J.; low operating cost; how plant works sludge handling features; operating highlights plant management.

Treatment Plants. Jonesboro, Ark. Flow Diagram of Typical Treatment Plant. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 3, Mar. 1944, pp. 150, 160. Plant in Jonesboro,

Information Please!

QUESTIONS AND ANSWERS ABOUT DOUGLAS FIR PLYWOOD

—your most versatile building material

QUESTION—What are the Standard Types of Douglas fir plywood?

ANSWER—Douglas fir plywood is manufactured in two standard types—moisture-resistant and Exterior.

●

QUESTION—What is the basic difference between these two types?

ANSWER—In the moisture-resistant types plies are held together almost always by protein glues; in the Exterior type the veneers are bonded together with a synthetic resin that is completely and permanently waterproof.

●

QUESTION—Where should Exterior types be used?

ANSWER—For all permanent outdoor uses, such as for house siding, marine construction, or garden furniture; and for interior uses where conditions of extreme humidity may apply, as, for instance, in a shower room.

●

QUESTION—Are moisture-resistant grades intended only for interior uses then?

ANSWER—In general, yes. However, certain grades of this type may be used for wall and roof sheathing, or sub-flooring, which are not strictly interior uses. Furthermore, a special grade of moisture-resistant type (see below) is made for use as concrete form material.

●

QUESTION—Within these types, how many grades are offered?

ANSWER—Moisture-resistant type plywood is available in four grades—Plypanel (in two appearance grades) for paneling cupboards and other built-ins; Plywall for walls, ceilings and partitions; Plyscord for sheathing and sub-flooring; Plyform for concrete forms.

Exterior type is available in several appearance grades similar to those offered in the moisture-resistant type. Sound 2 Side and Sound 1 Side are the most popular.

●

QUESTION—How can I be sure of getting a particular type or grade of Douglas fir plywood?

ANSWER—All standard types of Douglas fir plywood are "grade trade-marked." Every panel is stamped for easy identification. The various official grade trade-marks are pictured at the right.

●

QUESTION—What are the performance tests for Douglas fir plywood?

ANSWER—All Douglas fir plywood must meet the rigid performance tests outlined in Commercial Standard CS-45-42, published by the Bureau of Standards of the U. S. Department of Commerce.

●

QUESTION—What is the test for Exterior type Douglas fir plywood?

ANSWER—Random samples taken from production runs are subjected to the boiling test described in CS-45-42. Briefly, they are boiled in water for four hours; dried for 20 hours at high temperature; boiled another 4 hours. While still wet samples are mechanically pulled apart in a glue-line testing machine. Examination of the specimen must show that the bond between the plies is stronger than the wood itself.

●

QUESTION—What about tests for moisture-resistant types?

ANSWER—Naturally they are less severe. They require that samples must retain their form and most of their strength when occasionally subjected to cycles of thorough wetting and drying.

●

QUESTION—What technical data concerning Douglas fir plywood is available?

ANSWER—The following booklets and publications are available without charge from the Douglas Fir Plywood Association, Tacoma 2, Washington:

ENGINEERS HANDBOOK "Technical Data on Plywood" CS-45-42 (This is also included in the Handbook) WALL CHART, listing standard thicknesses, widths and lengths by types and grades.

●

QUESTION—What other sources of information are there?

ANSWER—Additional information may be secured from the U. S. Forest Products Laboratory and the Bureau of Standards, as well as from the field organization or the Technical Department of the Douglas Fir Plywood Association.

●

QUESTION—Is Douglas fir plywood available now?

ANSWER—Because of its many advantages, Douglas fir plywood is being used extensively in all types of war production. For the present, Douglas fir plywood is allocated by the War Production Board only for direct war uses. When the need is less urgent, Douglas fir plywood will again be available to help you build better structures—faster.

●

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Washington

Official Grade Trade-Marks

PLYPANEL D.F.P.A.
TRADE MARK REG. U. S. PAT. OFF. PEND.

These words appear on the edge of every genuine PLYPANEL grade panel.

GENUINE
-PLYSCORD-
SHEATHING
D. F. P. A.
INSPECTED

This stamp appears on the face of every genuine PLYSCORD grade panel.

GENUINE
DOUGLAS FIR
PLYFORM
Concrete Form Panel
D. F. P. A.
INSPECTED

This stamp appears on the face of every genuine PLYFORM panel.

GENUINE
PLYWALL
Douglas Fir Plywood
WALLBOARD
D. F. P. A.
INSPECTED

This mark is stamped on the back of every genuine PLYWALL panel.

EXT.-D.F.P.A.
TRADE MARK REG. U. S. PAT. OFF. PEND.

These words appear on the edge of every panel* of genuine EXTERIOR type Douglas Fir Plywood indicating that it is suitable for permanent exterior use.

DOUGLAS FIR
PLYWOOD
Real Lumber
MADE LARGER, LIGHTER
SPLIT-PROOF
STRONGER

FOUNDATIONS

PRETEST UNDERPINNING
CONCRETE-STEEL PILES
MASS CONCRETE CONSTRUCTION
HEAVY SHORING
DRILLED-IN CAISSONS

Send for catalogs descriptive of the latest foundation types and methods.

SPENCER, WHITE & PRENTIS, INC.
10 EAST 40th ST. NEW YORK 16, N. Y.

DRILLED-IN CAISSONS
FOUNDATIONS
UNDERPINNING

WYTEFACE "A"
TRADE MARK
STEEL TAPES

K & E
REG. U. S. PAT. OFF.

Easy-to-read, *raised* black graduations on crack-proof white surface . . . resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

I'LL TAKE THE WHITE ONE EVERY TIME!
STEVENS WYTEFACE "A"
KEUFFEL & ESSER CO.
WYTEFACE
TRADE
INCH
GRADUATED IN INCHES OR TENTHS

EST. 1867
KEUFFEL & ESSER CO.
NEW YORK · HOBOKEN, N. J.
CHICAGO · ST. LOUIS · SAN FRANCISCO · LOS ANGELES · DETROIT · MONTREAL

Ark., designed to treat over one million gal per day, consists of two primary clarifiers, two trickling filters, final clarifier, two multi-digesters, and sludge-drying beds.

TREATMENT PLANTS, MATERIALS CONSERVATION. Build Your Own! B. J. Cash. *Water Works & Sewerage*, vol. 91, no. 2, Feb. 1944, pp. 76–77. Drawings and brief details of two pieces of equipment made from materials available; description of copper sulfate feeder made from stone jar, and device used to open and close outside control valve from inside of building.

TREATMENT PLANTS, POSTWAR. Construction for Wastes Treatment—Postwar Forecast, G. L. Hall. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 3, Mar. 1944, pp. 140–142, 144. Reports of Sanitary Engineers from Maryland, Nevada, Mississippi, New Hampshire, and Missouri on postwar plans.

TREATMENT PLANTS, SAN DIEGO, CALIF. San Diego's Sewage Treatment Plant, B. D. Phelps. *Western City*, vol. 20, no. 3, Mar. 1944, pp. 18–20. Description of 32-mgd sewage-treatment plant for City of San Diego, which was completed at cost of $939,965; operation of plant; vacuum removes grease; clariflocculators; digestion system; odor control maintained.

TREATMENT PLANTS, WASTE UTILIZATION. Municipal Sewerage—Unrecognized Ally, J. A. Hurley. *Am. City*, vol. 59, no. 3, Mar. 1944, pp. 43–45. Survey of ways that municipal sewage treatment plants can and do help during war period; "fighting" phase of sewage treatment plants discussed; various products that can be reclaimed from sewage waste are enumerated, including fertilizer, grease for use in nitroglycerine, fuel oil, etc.

TREATMENT PLANTS, WICHITA, KANS. How Wichita Solved Its War-Sewerage Problems, P. L. Brockway. *Am. City*, vol. 59, no. 2, Feb. 1944, pp. 46–48. Odor nuisance, inadequate plant capacity, and sludge-handling problems are overcome in Wichita's sewage treatment plant, recently reconditioned; chemical precipitation furnishes flexibility for unusual flows in tributary stream; manner in which work was accomplished; illustrations given.

STRUCTURAL ENGINEERING

FLOORS. New Lease on Life for Heavy Duty Factory Floors, H. D. Humphries. *Southern Power & Industry*, vol. 62, no. 2, Feb. 1944, pp. 94–97. Purpose of article is to discuss floors whose wearing surfaces have failed to live up to accepted standards of quality expected of them, and to suggest to plant executives how surfaces may be rehabilitated through placing of new floor finishes or toppings; basic requirements; finishes for new floors; topping on hardened base; topping before base has hardened; resurfacing; top course special conditions; hardening agents.

PROPOSED COURSE. College Course in Construction Engineering, A. J. Ackerman. *J. Eng. Education*, vol. 34, no. 5, Jan. 1944, pp. 406–417. Suggested course majoring in construction engineering for civil engineering colleges is detailed. Before Soc. Promotion Eng. Education.

TRUSSES, WOODEN. Prefabricated Timber Bowstring Trusses 200 Ft. Long. *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, pp. 408–409. Bowstring type of truss, used in addition to airplane plant, offers economy of material in truss, lower height of side walls, less leverage for horizontal forces and advantages in camouflage treatment.

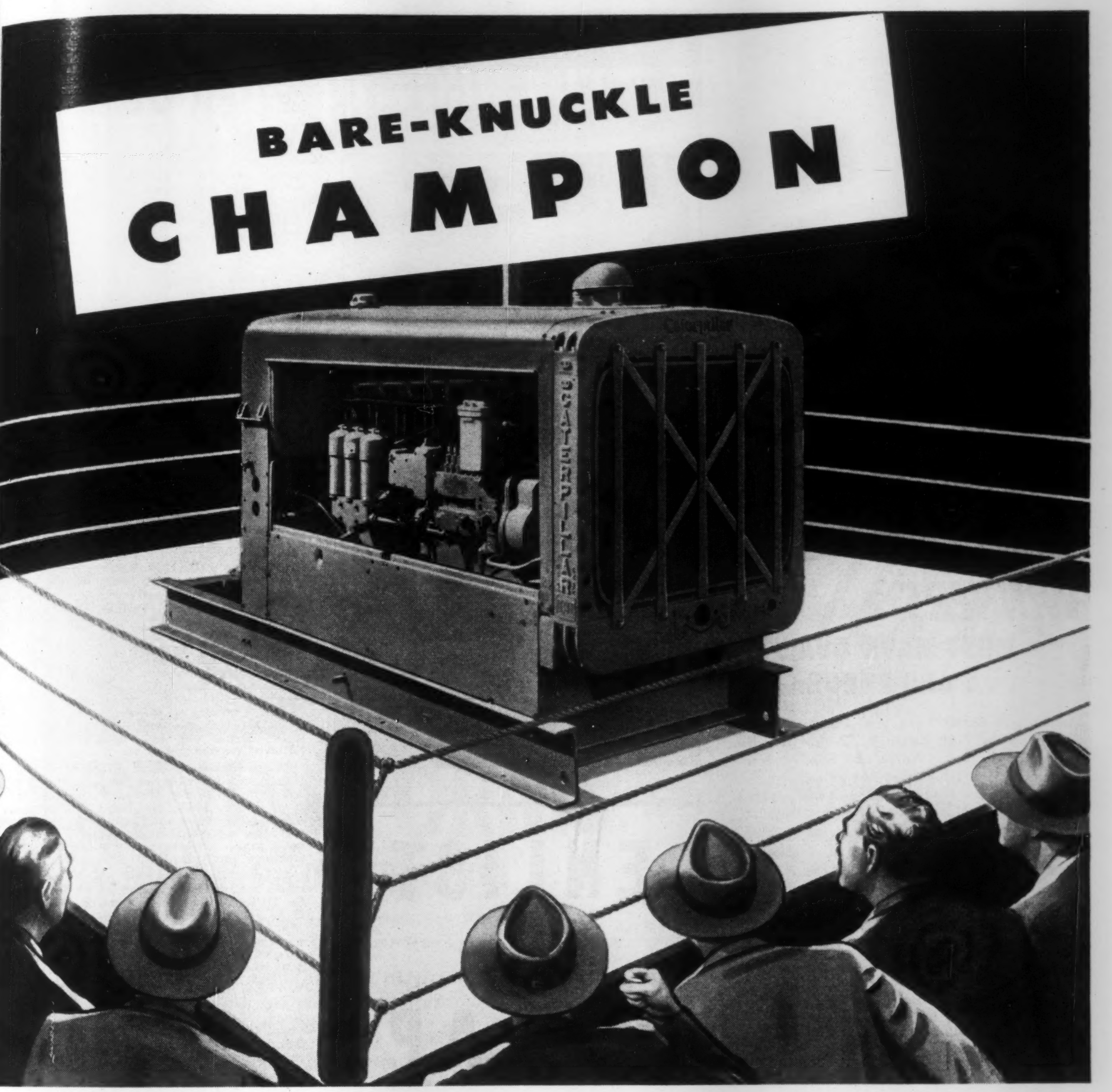
WALLS, BRICK. Thermal Protection and Resistance to Humidity of Walls of Metallurgical Brick and Metallurgical Vitrified Brick, J. S. Cammerer. *Am. Cer. Soc.—Bul.*, vol. 23, no. 3, Mar. 15, 1944, p. 53. Thermal conductivity of metallurgical brick was investigated on actual walls of houses, in special buildings, in laboratory, and on brick itself; results discussed.

WALLS, MASONRY. Facts About Cavity Wall Construction. *Brick & Clay Rec.*, vol. 104, no. 2, Feb. 1944, pp. 27–28. Modified use of cavity walls approved by FHA and New York City building department; damp English climate has proved well constructed cavity walls are moisture proof; fireproof walls also give good heat insulation; definition of cavity wall as formulated by Structural Clay Products Inst.; quality mixes are necessary; good wall ties have long life; cavity wall construction; simple rules for spacing ties; poor flashing will cause wall failure; how to provide weep holes.

WOODEN CONSTRUCTION, STEEL REINFORCEMENT. Modern Welding and Structural Design, A. Cibulka. *Welding J.*, vol. 23, no. 2, Feb. 1944, pp. 124–127. Welding has made possible invention of "reinforced steel timber," that is, steel and timber working together as statical unity and protecting each other against weather or fire hazards; comparison is made between welded "RST" columns and "rolled" Bethlehem H columns; bridges, arches, structures of unusual dimensions, earthquake and fireproof structures are economically feasible with "RST" welded designs.

TUNNELS

RAILROAD, FIRES. Fire in Long, Timber-Lined Tunnel Presented Tough Problems, A. E. Perlman. *Ry Age*, vol. 116, no. 10, Mar. 4, 1944, pp. 450–453. 72 days were required to restore to service 1,570-ft single-track bore on Moffat line, where blaze had cost three lives; actual job of



The "Caterpillar" Diesel Engine is all-time bare-knuckle champion in its class. It packs more power and can take more punishment than any other heavy-duty engine of its size.

No other Diesel built can match the simplicity of this engine—more important than ever when skilled operators are scarce. It's as nearly fool-proof as an engine can be made. There are only three simple operating adjustments—valves, fan-belt and water pump.

From fan to flywheel, the whole engine is "Caterpillar"-built. The fuel system is typical of sound "Caterpillar" design and construction. It requires no adjustments whatever. It can burn any type of fuel that's handy, from cleaned crude oil out of a pipeline to high-octane gasoline. And its fuel economy is famous.

"Caterpillar" Diesel Engines are built for full-load, full-time work—for more productive hours on the job and longer life. They have positive protection against dust, mud and water.

Ease of servicing is a big factor in their favor. Every part that is subject to wear can be replaced with a minimum of labor and expense.

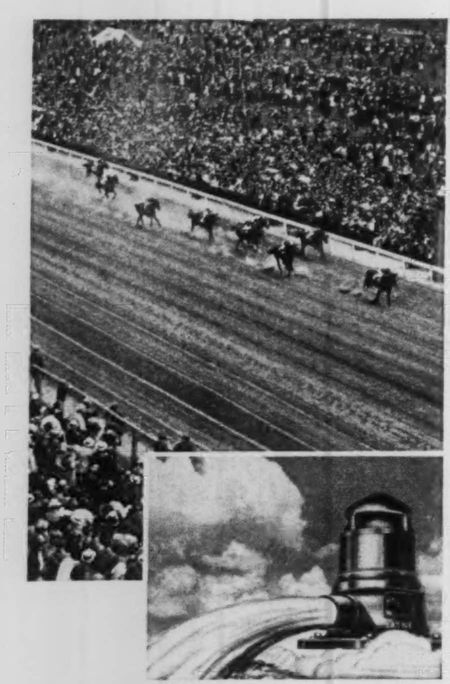
Because "Caterpillar" Diesel Engines are used to power so many different types of equipment—such as excavators, compressors, crushers, locomotives, gravel plants and rollers—it is possible to standardize on them and thus reduce service and operating costs. And they can be hooked up in multiple installations with no loss in efficiency and definite advantages in work output.

Right now, "Caterpillar" Diesels are contributing millions of rugged horsepower to winning the war. With the coming of victory, our full production will once more be available for peacetime jobs. In the meantime, your "Caterpillar" dealer is fully equipped to keep your present machines in running order. Call on him for counsel and service. And if you are qualified to get a new "Caterpillar" Diesel, he will explain how you can apply for it.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

CATERPILLAR DIESEL
REG. U.S. PAT. OFF

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!



WINNERS

MUST HAVE QUALITY . . . AND ENDURANCE

Maybe you didn't have your money on the winner in the 70th Kentucky Derby! Maybe you couldn't pick a horse like Pensive from a field of 16 starters. But one thing you did know—and have always known—is that it takes quality and endurance to win in any race.

In buying your postwar Water System, you had better remember the quality-endurance formula. You can't afford to own an "also ran" water system when the days of war are over and peace is here again.

You can put your money square on the "nose" of a Layne Water System—and always win. You will win on quality and endurance. You will get large quantities of water at low cost. You will get dependable performance year in and year out. And you will get a mighty big reward in knowing that you own the world's finest and most efficient Water System.

Right now is a good time to make preliminary plans. You can secure the aid of Layne Engineers without obligation. You can get set for the days of peace. Late literature will be helpful. Address Layne & Bowler, Inc., General Offices, Memphis 8, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

LAYNE

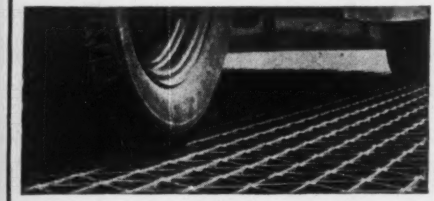
WELL WATER SYSTEMS
DEEP WELL PUMPS

BUILDERS OF WELL WATER SYSTEMS
FOR INDUSTRIES AND MUNICIPALITIES

IRVING DECKING

The Open Steel Mesh Bridge Pavement

Lightweight • Non-Skid • Economica
One-Piece • Clean • Permanent



SAFETY
thru Cleanliness plus Traction

ECONOMY
thru Lightweight plus Durability

May we send our catalog?

ESTABLISHED 1902
IRVING SUBWAY GRATING CO., INC.
HOME OFFICE and PLANT: 5008 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE.
EMERYVILLE 8, CALIFORNIA

ENLIST YOUR SCRAP

Not an ounce of iron or steel should take a rest today. Your rule is: *If it isn't working, scrap it!* Send it to war.

Half of every gun, tank, and ship is scrap. *Your* scrap is needed.

THIS IS *SCRAP:* Obsolete machines and parts—old jigs, dies, and fixtures, unused tools . . .
TURN IT IN — *NOW*

BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE
Room 1253 50 Rockefeller Plaza
New York 20, N. Y.

estimating damage had to be delayed longer tha three weeks because of continued intense heat spalling rock, and persistent monoxide gas; fi fighting and reconstruction methods described.

WATER SUPPLY, COLORADO. Alva B. Adam Tunnel—Longest Ever Driven from Two Faces *Western Construction News*, vol. 19, no. 2, Feb 1944, pp. 55–58. All but 8,000 ft of 13-mil tunnel to carry excess water from Pacific slop headwaters of Colorado River to east slope farm lands is driven; contractors work from each end using latest tunneling methods that result i speedy progress; tunnel design, work on we portal, and ventilation and support are briefly discussed.

WATER RESOURCES

MILITARY ENGINEERING, WATER SUPPLY. Water Supply by Combat Engineers, J. A. Lieberman. *Military Engr.*, vol. 36, no. 220, Feb. 1944, pp. 52–58. Description of problems and methods used by Engineer Battalion in South Pacific; equipment, sources, treatment, storage and distribution, and development of water point are among topics considered.

WATER TREATMENT

CHLORINATION. Tests for Active Residual Chlorine and Chloramine in Water, F. J. Hallinan. *Am. Water Works Assn.—J.*, vol. 36, no. 3, Mar. 1944, pp. 296–302. Simple ortho-toledine arsenite (OTA) field test for residual chlorine and one for chloramine applicable to concentrations likely to be encountered in treatment of water, are described.

SEA WATER, SALT REMOVAL. Drinking Water from Sea. *Mfrs. Rec.*, vol. 113, no. 2, Feb. 1944, pp. 44–45. New chemical that takes salt out of sea water in 20 min and permits flier to carry makings of 14-days supply of drinking water in rubber life raft, developed by Permutit Company; "desalter" weighs only $3^1/_2$ lb and converts over 14 pt of sea water into drinking water; chemical is carried in form of briquets size of small candy bar; when dropped into plastic bag filled with sea water, chemical quickly absorbs dissolved salts permitting them to be filtered out as water is sucked through plastic tube.

WATER BACTERIOLOGY. Bacteriological Examination of Chlorinated Water, R. E. Thompson. *Water & Sewage*, vol. 82, no. 2, Feb. 1944, pp. 27–28, 40–46. Discussion of problem of employing bottles treated with sodium thio-sulfate for collection of samples of chlorinated water for bacteriological examination in water works laboratories; tests carried out in Toronto and procedure followed are reported.

WATER BACTERIOLOGY. Difficulties and Limitations in Bacteriological Examination of Water, M. Levine. *Water Works & Sewerage*, vol. 91, no. 3, Mar. 1944, pp. 109–112. Discussion of various difficulties and limitations; importance of sampling and shipping precautions; detection of colon group; interpretation of findings; sampling stations; analysis of well water supplies.

WATER BACTERIOLOGY. Resistance of Coliforms and Enteric Pathogens to Free Chlorine, G. T. Butterfield, E. Wattie, S. Magregian, and C. W. Chambers. *Water & Sewage*, vol. 82, no. 3, Mar. 1944, pp. 27, 40, and 42. Influence of time of exposure, H-ion concentration, and temperature on survival of coliforms and enteric pathogens when exposed to free chlorine.

WATER WORKS ENGINEERING

PUBLIC UTILITIES, POSTWAR. Moultrie's Long-Range Improvement Program. *Pub. Works*, vol. 75, no. 1, Jan. 1944, pp. 25–26. Abstracts from report of long-range program of public improvements for city of Moultrie, Ga., prepared in 1941 by City Manager, G. A. Shaver, with assistance of Local Public Works Programming Office of Federal Works Agency; prominent feature of report is tabulation of data supporting statements of report, and plotting of same on 8 diagrams; recommendations for physical improvements and additional expenditures for services, for which provision is made in financing scheme developed.

UNITED STATES. Water Supply Needs—$683 Million! *Eng. News-Rec.*, vol. 132, no. 12, Mar. 23, 1944, pp. 420–421. Summary of report of findings of U.S. Public Health Service, indicating need for $683,300,000 worth of new water-supply facilities.

WATER TANKS AND TOWERS. Elevated Water Storage, W. M. Scott. *Water & Sewage*, vol. 82, no. 3, Mar. 1944, p. 46. Advantages of elevated storage as part of water supply system. Before Am. Water Works Assn.

WATER TANKS AND TOWERS. Wooden Tank on Concrete Tower Used for War Plant. *Water Works Eng.*, vol. 97, no. 4, Feb. 23, 1944, p. 182. Rigid frame, reinforced concrete water tower, over 115 ft high, supports 100,000-gal redwood tank, 30 ft 6 in. in diameter; tank consists of 3-in. plank floor laid directly on concrete supporting structure with 3-in. stave sidewalls held in place with $^3/_4$-in. round steel hoops.

WATER WELLS, MAINTENANCE AND REPAIR. Maintenance of Water Wells, N. E. Gunderson. *Water Works & Sewerage*, vol. 91, no. 2, Feb. 1944, pp. 69–71. Three principal causes for shortage of water supply are lowering of ground-water level, condition of well, and condition of pumping unit; mechanical and chemical methods of well cleaning are described.

ANSWERS TO YOUR FORM PROBLEMS for Straight and Curved Walls

INSIDE FORMS ERECTED
OUTSIDE FORMS READY FOR 2ND POUR
CHARLES MO. MUNICIPAL RESERVOIRS
CLEAN AND NEAT AFTER STRIPPING UNI-FORMS

USE AND RE-USE UNI-FORMS

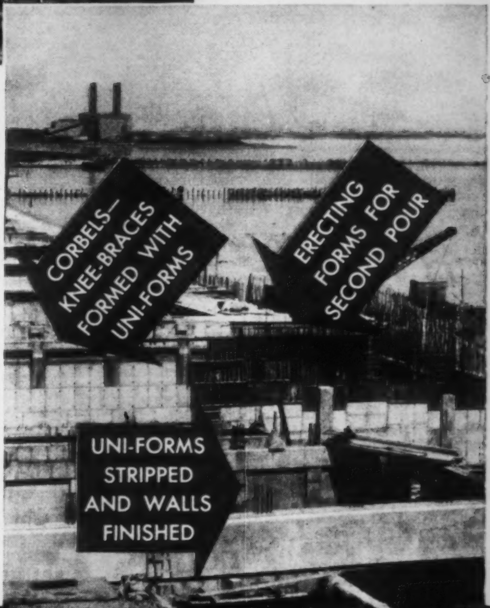
FOR WATERWORKS CONSTRUCTION . . .

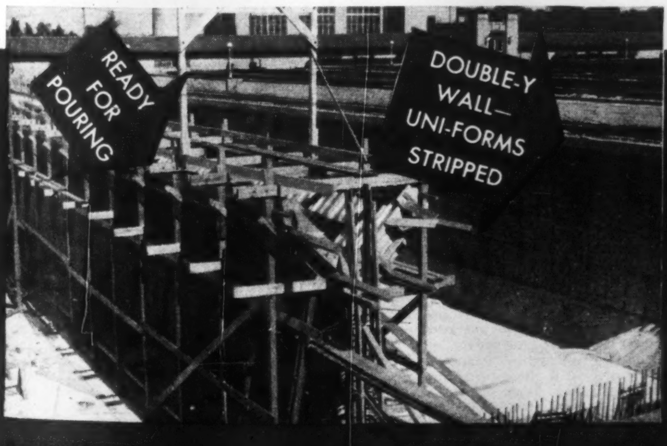
Strategically located stocks of Uni-Forms are immediately available on either a rental or purchase basis.

Adaptability of Uni-Forms makes them particularly valuable for the wide variety of structural requirements encountered in waterworks construction.

Engineering Counsel regarding the practicability of Uni-Forms is yours for the asking . . . no obligation, of course.

Write for Uni-Form Catalog Today


CORBELS— KNEE-BRACES FORMED WITH UNI-FORMS
ERECTING FORMS FOR SECOND POUR
UNI-FORMS STRIPPED AND WALLS FINISHED


READY FOR POURING
DOUBLE-Y WALL— UNI-FORMS STRIPPED

Universal FORM CLAMP CO.

1246 N. KOSTNER AVE. CHICAGO 51

Branches: Atlanta, Cleveland, Houston, Los Angeles, New York, San Francisco

Distributors in all principal cities

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Coal Mines and Mining, Conveying. Suspension Bridge for Belt Conveyor, J. J. Belasco. *Min. Congress J.*, vol. 30, no. 1, Jan. 1944, pp. 16–17. At Belair coal mine of Pardee & Curtin Lumber Co., near Webster Springs, W. Va., main haulage is with 30-in. belt conveyor which discharges into 40-ton surge bin; from bottom of this bin coal is fed to outside belt conveyor 30 in. wide and 700 ft long; this conveyor crosses Gauley River and over highway, on suspension bridge with two 136-ft spans; bridge utilizes, to fullest extent, materials salvaged from scrap.

Highway, Alaska. Alaska Highway Bridge of Treated Timber Erected Despite Flow of Ice-Laden River. R. P. Agnew and J. B. Kiely. *Construction Methods*, vol. 26, no. 5, May 1944, pp. 64–65, 152, 154, 156, 158, 160. Illustrated description of construction of creosote-treated timber bridge, consisting of main river deck truss span 195 ft long with 114-ft deck-truss span on each side.

Highway, British Columbia. Three-Span Bridge with Treated Wood Trusses Built on Alaska Highway, S. W. Powell. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 70–71, 102, 104, 106, 108, 110, 112, 114. Sikanni Chief River bridge spans consist of four 140-ft deck-K trusses, framed with treated Douglas fir timber; bridge has three spans, 144 ft center to center of piers measured along grade line, with three-bent pile trestle for east approach and five-bent for west approach, making total length of 584 ft; roadway is 24 ft wide.

Light Metals. Aluminum in Military Science. *Light Metals*, vol. 7, no. 73, Feb. 1944, pp. 65–71. Résumé on applications of light and ultra-light alloys; chemical reactivity, low specific weight and certain projectile-resisting qualities of light alloys are among aspects reviewed; light metals in pyrotechnics; emergency bridges; loading system for pontoons; huts and barriers; armor plating; small arms; anti-gas equipment.

Railroad, Maintenance and Repair. Bridge Shop on Erie Proves Worth in Wartime. *Ry. Eng. & Maintenance*, vol. 40, no. 5, May 1944, pp. 434–437, 444. Description of facilities devoted to reworking and reclaiming second-hand steel for carrying on regular bridge program despite steel shortage.

Suspension, Failure. Failure of Tacoma Narrows Bridge. *Texas Agric. & Mech. College—Eng. Experiment Station—Bul. No. 78*, 1944, 3 sections, paged separately. Contribution to work of Advisory Board on Investigation of Suspension Bridges by U.S. Public Roads Administration and Agricultural and Mechanical College of Texas; reprint of Davis, Carmody, and Carew reports.

BUILDINGS

Airports. Now—"Packaged" Airports, J. L. deCubas. *Aviation*, vol. 43, no. 5, May 1944, pp. 116–118, 253 and 254. Everything from beacons. and generators to terminal buildings, for tropic, temperate, or arctic service, is included in Westinghouse International's new engineered units; almost infinite number of combinations, to erect any type of airport, can be supplied, and shipped by air if desired.

China. Rebuilding in China Replaces Jap-Bombed Areas with Both Modern and Primitive Structures. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 82 and 132. Brief description of building construction in Kunming, by use of wood, mud, and bamboo.

School Buildings, Brick. Lots of Brick in This School. *Brick & Clay Rec.*, vol. 104, no. 5, May 1944, pp. 27–29. Brief details of Rugen School, Glenview, Ill., constructed mainly of brick; classrooms open directly outdoors; plan of school showing scheme for complete structure is given; brick chosen as building material best adapted for use on midwestern prairie land in long, low building designed to blend into landscape; when first wing was built, wood was used wherever possible as complementary material to brick.

Turkey. Modern Building Construction in Turkey, O. M. Emre. *Bldg. Standards Monthly*, vol. 13, no. 4, Apr. 1944, pp. 4–6. Brief commentary on design and construction; illustrations given; most widely used type of construction is reinforced concrete frame with brick or stone filler walls.

CITY AND REGIONAL PLANNING

City Planning. So You're Going to Plan a City. *Traffic Eng.*, vol. 14, no. 7, Apr. 1944, pp. 166, 168, 170, and 171. Governing purpose in city planning is to plan and build, or to replan and rebuild cities for material and spiritual well being of those who dwell therein; every city must be economically efficient, comfortable to live in and beautiful; framework of facts; overlapping problems; replanning interior; communities of garden cities; redistribution of land use. Excerpts from article published in *Fortune*, Jan. 1944.

CONCRETE

Aggregates, Panama Canal. Two Plants Producing Aggregates for Third Locks Project of Panama Canal, J. D. Gregg. *Pit & Quarry*, vol. 36, no. 10, Apr. 1944, pp. 80–85. For supplying about 13,500,000 tons of aggregates required for Third Locks on Panama Canal, sand and gravel are to be produced out of Chagres River and crushed rock from rock of Miraflores Locks; Chagres and Miraflores aggregates plants are designed to operate under full-load capacity at least 98% of time during any shift; description of each plant, with flowsheets.

Bridges. Highway Bridge of Special Design. *Ry. Age*, vol. 116, no. 17, Apr. 22, 1944, pp. 782–783. Details pertaining to reinforced concrete overhead highway bridge constructed by Pennsylvania Railroad across tracks near Aberdeen, Md.; overcrossing is of rigid frame construction with suspended section in main span supported on cantilever arms.

Cement Handling, Pneumatic. Compressed Air on Job at Fontana Dam, A. M. Hoffmann. *Compressed Air Mag.*, vol. 49, no. 3, Mar. 1944, pp. 78–79. Brief illustrated item on handling of cement at one of TVA projects; cement delivered in box cars is transferred to hoppers, thence by conveyor to surge tank, thence by gravity to air-activated conveyor tank; use of air-operated, bottom-dump buckets for concrete pouring.

Construction, Mines and Mining. Concrete for Mines: Shaft, Slope, and Entry Applications, A. E. Belton. *Coal Age*, vol. 49, no. 5, May 1944, pp. 88–92. Concrete's advantages in shaft, slope, and entry work; how it should be used; grouting to seal water-bearing strata; gunite and plaster applications and how they should be made.

Culverts. Concrete Arch Quantities by Graphics, T. W. Oliver. *Eng. News-Rec.*, vol. 132, no. 10, Mar. 9, 1944, pp. 342–343. Outline of method for calculating volume of concrete in sloping end-sections, or wings, of arch culverts under highways.

Lime, Hydraulic. Hydraulic Lime as Binder for Concrete, W. Kronsbein. *Am. Cer. Soc.—Bul.*, vol. 23, no. 5, May 15, 1944, p. 85. Results of tests made on 16 kinds of limestone; their suitability for use in concrete determined; limestones varied widely in chemical composition and physical properties; tests also made on effect of trass and fly ash on strength of testpieces made of lime; effect of these additions on weak limestones was very marked. Brief English abstract from *Tonindustrie Ztg.*, vol. 65, no. 45, pp. 431–432, no. 46, pp. 445–446, 1941.

Pipe, Manufacture. Pumped Concrete Replaces Hand Shoveling in Feeding Rotating Forms for Prestressed Pipe. *Construction Methods*, vol. 26, no. 5, May 1944, pp. 74, 142, 144, 146, and 148. By substituting mechanical pumping for hand shoveling in feeding concrete into rapidly rotating forms for manufacture of prestressed pipe in sizes from 12 to 60 in., inside diameter, Lewistown Pipe Company of Chicago, has doubled output with one-half labor force formerly used.

Properties. Torsional Resistance of Plastic Materials with Special Reference to Concrete, W. T. Marshall. *Concrete & Constr. Eng.*, vol. 39, no. 4, Apr. 1944, pp. 83–88. Comparison of experimental results of concrete and theoretical studies on strength of true plastic under torsion.

Water Tanks and Towers. Million-Gallon Elevated Tank and Reservoir. *Concrete & Constr. Eng.*, vol. 39, no. 2, Feb. 1944, pp. 25–34. Rectangular tank supported on numerous small columns with horizontal bracing constructed 37 ft 6 in. above $1^1/_2$ million-gal reservoir, tank being provided to supply highest points of area above level of new and existing reservoirs; construction methods are detailed, and plan drawings are included.

DAMS

Penstocks, Welded Steel. Penstocks at Green Mountain, P. J. Bier. *Western Construction News*, vol. 19, no. 4, Apr. 1944, pp. 64–68. Installation of 102-in. penstocks through Green Mountain Dam of Colorado-Big Thompson Project presented problems in design; irrigation release passes through 50-in. pipes by branching off penstock tubes; pipes welded and tested by X-ray to eliminate faulty joint sections.

FOUNDATIONS

Excavation, Cold Weather. Excavating at 70° Below Zero. *Pac. Bldr. & Engr.*, vol. 50, no. 1, Jan. 1944, pp. 36–38. Illustrated discussion of projects involving roads, buildings, and installations of numerous types and, in some cases, airbases, which were completed by U.S. Army Engineers in Alaska.

Silos. Caisson Sinking for Foundations of Silos, L. E. Hunter. *Civ. Eng.* (London), vol. 39, nos. 449 and 450, Nov. 1943, pp. 247–250, Dec. pp. 270–272. Report on layout and sinking of six reinforced concrete caissons supporting front half of grain silo in south of England; work was of complicated nature because site was built up ground, of which fill was 3 to 4 ft of rubble, clay, etc., and below that lumps of hard-core showing site had evidently been quarry in past; report on difficulties encountered in sinking and completion of caisson work when sinking was finished.

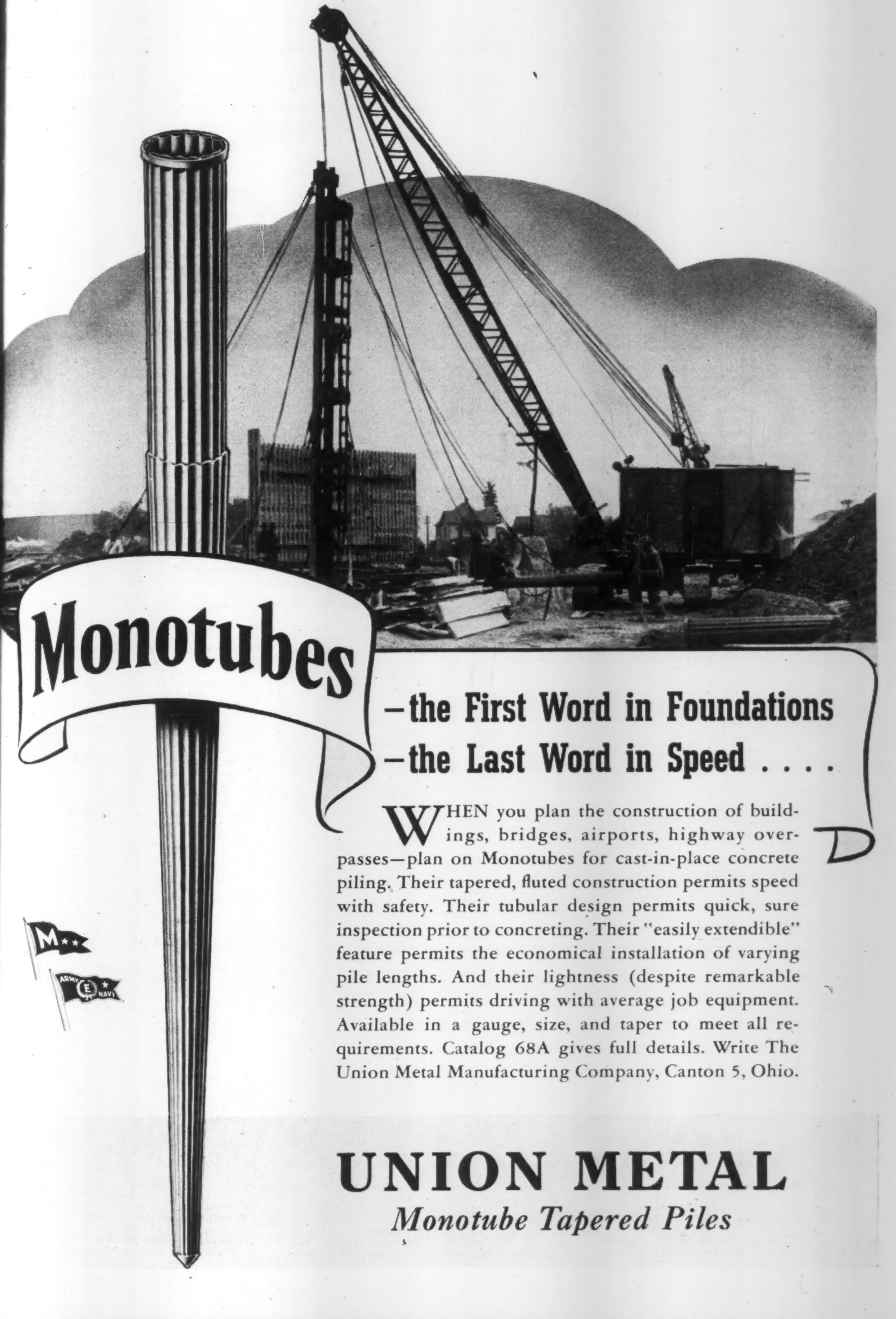
HYDROELECTRIC POWER PLANTS

Washington. Tacoma Goes After More Power, H. W. Young. *Compressed Air Mag.*, vol. 49, no. 2, Feb. 1944, pp. 36–40. Illustrated notes on project of City of Tacoma, Wash., similar to description previously indexed from *Western Construction News*, Jan. 1944.

MATERIALS TESTING

Concrete Aggregates. Concrete and Concrete Aggregates. *Am. Soc. Testing Matls.—Standards* (1943 Supp.), pt. II, 1943, pp. 43–47, 105–111. Test for volume change of cement mortar and concrete; specifications for sodium chloride, and for ready-mixed concrete.

Concrete Aggregates. Studies to Develop Accelerated Test Procedure for Detection of Adversely Reactive Cement-Aggregate Combinations, T. E. Stanton. *Am. Soc. Testing Matls.—Proc.*, vol. 43, 1943, pp. 875–893, (discussion) 894–904. Tests discussed include chemical analyses of both aggregate and cement, mineralogical and petrographic analyses, fluorescence under ultra-violet light, reaction of cement aggregate combinations in caustic solutions, dynamic (sonic) modulus changes with relation to expansion, cement content, and curing procedure; results. Bibliography.



—the First Word in Foundations
—the Last Word in Speed . . . .

WHEN you plan the construction of buildings, bridges, airports, highway overpasses—plan on Monotubes for cast-in-place concrete piling. Their tapered, fluted construction permits speed with safety. Their tubular design permits quick, sure inspection prior to concreting. Their "easily extendible" feature permits the economical installation of varying pile lengths. And their lightness (despite remarkable strength) permits driving with average job equipment. Available in a gauge, size, and taper to meet all requirements. Catalog 68A gives full details. Write The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Tapered Piles

Concrete, Curing. Effect of Curing Methods Upon Durability of Concrete as Measured by Changes in Dynamic Modulus of Elasticity, B. G. Long and H. J. Kurtz. *Am. Soc. Testing Matls.—Proc.*, vol. 43, 1943, pp. 1051–1065, (discussion) 1066–1068. Effect of membrane curing, "standard" moist curing, and no curing, upon durability of concrete subjected to laboratory freezing and thawing, as measured by changes in modulus of elasticity determined by dynamic methods described; visual examinations and dynamic modulus of elasticity tests conducted on 3$^1/_2$-year-old test wall, in which 5-ft square concrete panels were cured.

Concrete Slabs. Tests of Fire Resistance and Thermal Properties of Solid Concrete Slabs and Their Significance, C. A. Menzel. *Am. Soc. Testing Matls.—Proc.*, vol. 43, 1943, pp. 1099–1147, (discussion) 1148–1153. Performance of 16 solid concrete slabs 5$^1/_3$ ft wide by 6 ft high when exposed on one face to standard fire temperatures; slabs, cast horizontally of plastic concrete, were tested vertically and simulated solid wall specimens 4, 6, and 8 in. thick; slabs carried loads of 400 or 500 lb per sq in. during exposure to fire.

Mixing. Simplified Test for Evaluating Effectiveness of Concrete Mixers, W. P. Wing, V. Jones, and R. E. Kennedy. *Am. Soc. Testing Matls.—Proc.*, vol. 43, 1943, pp. 1001–1013, (discussion) 1014–1050. Test for evaluation batcher and mixer performance developed from study of numerous mechanical analyses of fresh mortar and of chemical analyses and compressive strength tests from 220 batches of concrete mixed in eight mixers; range in weight per cubic foot obtained by making specific gravity determinations on three samples of air-free mortar screened from fresh concrete used as index of mix uniformity.

Road Materials, Standards. Road and Paving Materials. *Am. Soc. Testing Matls.—Standards* (1943 Supp.), pt. II, 1943, pp. 43–51, 112–114. Tentative specifications and methods of testing non-bituminous and bituminous road materials.

PORTS AND MARITIME STRUCTURES

Airports, Southampton, England. Air Port of Southampton. *Dock & Harbour Authority*, vol. 24, no. 280, Feb. 1944, pp. 226–227. Scheme for seaplane base, combined with land airport, prepared by Southampton Harbour Board with approval of Director-General of Civil Aviation.

Docks, Walls. Notes on Dock Wall Design and Construction, R. D. Brown. *Dock & Harbour Authority*, vol. 24, nos. 280 and 281. Feb. 1944, pp. 233–235, March, pp. 258–259. Constructive suggestions given; conditions under which wall is to be designed and built; existing walls; examples of failure; alternative designs for Iron Ore Dock recently built at Iriam, in Port of Manchester; dock walls. Before Instn Civ Engrs.

New Orleans, La. Great Mississippi Port of New Orleans. J. A. McNiven. *Dock & Harbour Authority*, vol. 24, no. 281, Mar. 1944, pp. 247–251. Trade and future prospects; early Louisiana settlements; progress of port in twentieth century; organization; port facilities; Alexander Seaway; constructional features; fire prevention. Before Am. Assn. Port Authorities, New Orleans.

Southampton, England. Future of Southampton as Seaport, H. A. Short. *Dock & Harbour Authority*, vol. 24, no. 280, Feb. 1944, pp. 223–225. European problems; Southampton's prewar status; development of marine air base; industrial sites; future prospects. Before Southampton Civic Soc.

ROADS AND STREETS

Airport Runways, Maintenance and Repair. Aircraft Corrosion Resulting from Use of Calcium Chloride on Airport Runways, C. J. Janes. *U. S. Civ. Aeronautics Administration—Tech. Development Note No. 33, March 1944, 4 pp.* When icy runways are treated with calcium chloride, solution of low concentration is first splashed onto airplanes; as water evaporates, concentration increases until highly concentrated solution remains; this solution can be deposited in seams and inside wings where it cannot be readily washed off; serious corrosion and embrittlement appear possible; need for field surveys involving actual operations emphasized.

Construction Equipment, Maintenance and Repair. Heavy Equipment Maintenance on Alaska Highway Job. *Eng. & Contract. Rec.*, vol 57, no. 17, Apr. 26, 1944, pp. 21–23. Note on preventive maintenance program used to keep more than 24 units of heavy construction equipment moving on one of the last sections of the Alaskan Highway to be completed.

Highway Systems, California. Arroyo Seco Parkway Extension Adds Four Southbound Traffic Lanes, A. N. George. *Calif. Highways & Pub. Works*, vol. 22, nos. 1 and 2, Jan.-Feb. 1944, pp. 2-4. Illustrated notes on construction of additional facilities; much of earlier work on highway was carried on as project of federal government, which was closed down December 1942.

Highway Systems, Ontario. Economic Importance of Highways and Highway Transport, J. O. Goodman. *Eng. & Contract. Rec.*, vol. 57, no. 17, Apr. 26, 1944, pp. 18–20, 26–27. Factual information presented; statistical data pertaining to highway transportation in Ontario; author states that future of Ontario and Dominion as whole lies in unhampered development and utilization of all transportation facilities; note on postwar development. Before Ontario Good Roads Assn.

Highway Systems, Pan-American. Modern Highway to Panama Canal Progressing Despite Rough Terrain, J. L. Harrison. *Pit & Quarry*, vol. 36, no. 10, Apr. 1944, pp. 65–67, 70. Illustrated notes, with map showing route from Nuevo Laredo at Texas–Mexico border to city of Panama.

Military Engineering, Road Construction. Ledo Road, *Construction Methods*, vol. 26, no. 5, May 1944, pp. 56–60, 151. Illustrated description of equipment and methods used in construction of road from India to Burma.

Roadside Improvement. Controlling Roadside Vegetation, E. S. Whitaker. *Pub. Works*, vol. 75, no. 5, May 1944, pp. 25–26. Use of torches, spraying, and disking on California highways under wartime conditions; spraying is considered most desirable, with disking as best substitute where practicable.

Road Machinery. Modern Plant and Road Construction, R. U. Law. *Mech. Handling*, vol. 31, no. 2, Feb. 1944, pp. 54–55. Object of paper is to focus attention on types of mechanical equipment used on public works during war and to examine their use in road construction. Extracts from paper before Instn. Civ. Engrs.

Road Materials, Steel Mats. Battlefront Technique Adopted for Highway Construction. *Roads & Bridges*, vol. 82, no. 2, Feb. 1944, pp. 46–47, 82. With view to securing data regarding behavior of steel gratings under traffic, experimental stretch of road embodying steel grids in its construction was built as joint venture of town of Darien, Conn., and Irving Subway Grating Company of Long Island City, N.Y.; details of project.

Soil Cement. Soil-Cement Mixtures for Base Courses. *Roads & Bridges*, vol. 82, no. 2, Feb. 1944, pp. 48–50, 91–97, 99–100. Information on materials and construction methods now in use for building soil cement base courses for pavements; types of soil cement construction described cover incorporation of cement with subgrade soils, borrow soils, pit run materials and combinations of these materials by mixed-in-place, traveling, and stationary plant methods. Extracts from Report of Highway Research Board, Washington, D.C.

Wartime Maintenance. Wartime Highway Maintenance, G. E. Martin. *Pub. Works*, vol. 75, no. 4, Apr. 1944, pp. 11–13, 42–44. Article explains how combinations of road tar (no longer critical material) and aggregate can be used by proved methods for maintenance and repair of highways, by surface treatment, patching, and resurfacing.

SANITARY ENGINEERING

Postwar. Postwar Sanitation Projects Proposed in Quebec Province, R. Cyr. *Eng. & Contract. Rec.*, vol. 57, no. 16, Apr. 19, 1944, pp. 51–53 and 106. Municipalities plan extensive construction of filtration plants, reservoirs, sewers, etc.; brief commentary on various projects.

Sonoma County, California. Consulting Engineer Reports on Sonoma County Sewerage. *Western Construction News*, vol. 19, no. 4, Apr. 1944, p. 83. Recommendations made by sanitary engineer of San Francisco for prevention and more effective control of epidemics; corrective measures, inspection, and education part of recommendations.

SEWERAGE AND SEWAGE DISPOSAL

Aeration. Modified Sewage Aeration, L. R. Setter and G. P. Edwards. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 278–286. Purpose of paper is to indicate method of combining variables produced in tests so that each test falls into coherent pattern permitting rational interpretation and to indicate limitations and possibilities of modified sewage aeration.

Chemical Process. Chemical Treatment of Sewage as Wartime Aid. *Pub. Works*, vol. 75, no. 5, May 1944, pp. 20–21 and 26. Correct use of chemicals will generally increase capacity of sedimentation tanks and, so, of trickling filters or other secondary treatment; suggestions as to chemicals to be used, and how, and under what conditions such use is advantageous.

Chicago, Ill. Wartime Operation of Sewage Treatment Works, L. Pearse. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 5, May 1944, pp. 232–233. Brief outline of problems of Sanitary District of Chicago in industrial wastes, fuel, supplies, substitutes, repairs, temporary sludge disposal, and fertilizer production.

Chlorination. Chlorination of Sewage and Industrial Waste, H. A. Faber. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 211–215, (discussion) 215–217. Applications of chlorination to only three fields, disinfection, B.O.D. reduction, and control of odors and septicity, should be remedied, according to author, by research on other fields of application.

Chlorine Compounds. Mode of Action of Compounds Containing Available Chlorine. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 5, May 1944, p. 231. Abstracts of papers at meeting of Division of Water, Sewage and Sanitation Chemistry of Am. Chem. Soc.: Studies on Mode of Action of Compounds Containing Available Chlorine, H. C. Marks, O. Wyss, and F. Strandskov; Chemical Treatment of Soapy Waste Waters, H. W. Gehm; Effect of Solvents on Sludge Digestion, W. Rudolfs.

Review of Literature. Critical Review of Literature of 1943 on Sewage and Waste treatment and Stream Pollution, W. Rudolfs, H. E. Babbitt, G. P. Edwards, H. A. Faber, A. J. Fischer, H. W. Gehm, A. L. Genter, H. Heukelekian, H. J. Miles, F. W. Mohlman, C. C. Ruchhoft, L. R. Setter, L. W. Van Kieeck. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 222–277. Analytical procedures, sedimentation, chemical and mechanical treatment, grease removal, trickling filters, activated sludge, submerged contact aerators, chlorination, sludge digestion and disposal, stream pollution, industrial wastes. Bibliography.

Secondary Treatment. Secondary Treatment—Present and Future, D. W. Walker, A. W. West, L. H. Enslow, and A. S. Bedell. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 348–363. Symposium presented at Conference of Federation of Sewage Works Assns.

Sewage Tanks. Sewage Treatment for Homes and Institutions, A. E. Berry. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 328–332. Factors involved in construction and operation of septic tank systems for homes and methods best suited for institutional plants.

Sewage Tanks, Sludge Level Indicators. Sludge Level Sounding Chain, A. A. Hirsch. *Water Works & Sewerage*, vol. 91, no. 5, May 1944, p. 189. Description of sounding chain for measuring sludge depth in Imhoff tanks, in which links are marked directly with metal tags or rivets, stenciled with proper figures.

Sewers, Design. Sewers, C. H. Coberly. *Water Works & Sewerage*, vol. 91, no. 5, May 1944, pp. 186–188. Fundamentals of design and construction of sewers; discussion of loads on sewers, effect of sewage treatment on sewer construction, infiltration, volume of sewage flow, deposition of solids, size of pipe, flushers, and pumps.

Sewers, Gas Hazards. Gas Hazards in Sewerage Systems and Treatment Works, A. E. Kimberly. *Pub. Works*, vol. 75, no. 5, May 1944, pp. 14–17, 42, 44, 46. Fatal accidents in Ohio, their causes, and precautionary measures recommended for prevention where dangerous gases or oxygen deficiencies may exist; manhole investigations of Bureau of Mines; first-aid material. Information condensed from bulletin published by Ohio Dept. of Health.

Summary of Meeting. Mayor Knows His Sewage Treatment. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 5, May 1944, pp. 228–231. Summary of meeting of New Jersey Sewage Works Assn. in Trenton, March 23–24; symposium on postwar sewage construction, sludge handling, and wartime chemical changes.

Treatment Plants, Design. Sewage Treatment Practice-Standards for Municipal Sewage Treatment Plants, A. S. Bedell. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 318–327. Discussion of standards in practice in New York State Dept. of Health.

Treatment Plants, Grease Removal. Grease Removal at Army Sewage Treatment Plants, R. Eliassen and H. B. Schulhoff. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 287–313, (discussion) 313–317. Discussion of experiments using various auxiliary methods applied ahead of primary settling tanks to assist in removal of grease from sewage at Army sewage treatment plants; plain skimming tanks, chemical precipitation, diffused air aeration, mechanical aeration, aero-chlorination, and vacuum flotation are studied.

Treatment Plants, Grease Removal. Grease Removal by Vacuum Flotation, R. Eliassen and H. B. Schulhoff. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 287–295. Experiments conducted on Army camp sewage indicate that vacuum flotation process may be used to advantage in removal of grease from sewage. Before N.Y. State Sewage Works Assn.

Treatment Plants, Grit Chambers. Dual Grit Chamber and Measuring Flume, Y. Peterson. *Eng. News-Rec.*, vol. 132, no. 20, May 18, 1944, pp. 754–755. Grit-removal and flow-measurement facilities are provided by design, which utilizes single channel for both purposes in sewage plant at Santa Maria, Calif.; constant velocity flow of one ft per sec is secured throughout range of 250 to 1,000 gal per min.

Treatment Plants, Jonesboro, Ark. Sewage Treatment Plant at Jonesboro, Arkansas, C. A. Smith and L. M. Rebsamen. *Water Works & Sewerage*, vol. 91, no. 5, May 1944, pp. 157–162. General description, design data, and operating results are given for plant with average total flow of about 750,000 gal.

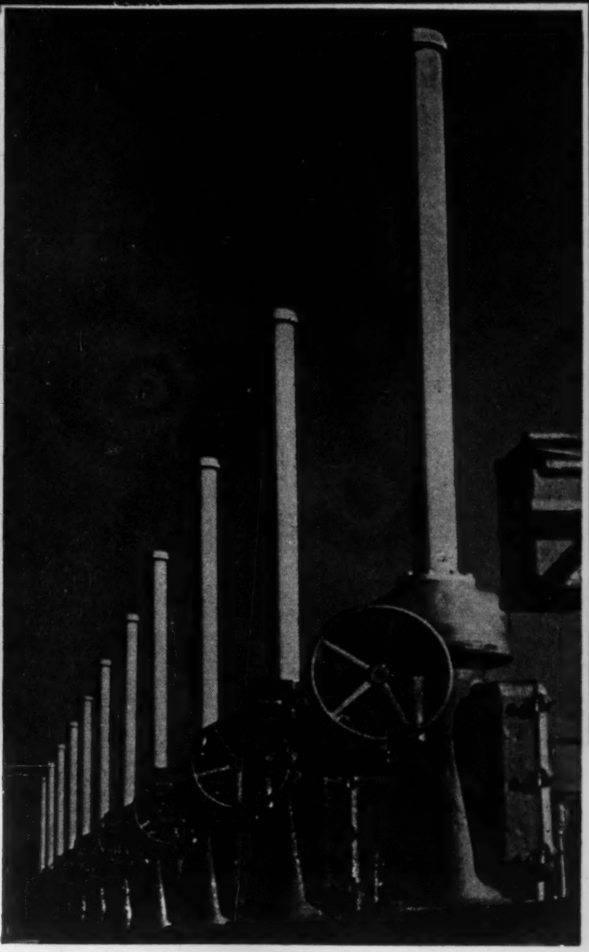
Treatment Plants, La Porte, Ind. Biofiltration Plant Serves War Housing Project, R. F. MacDowell. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 5, May 1944, pp. 226–227. Two-stage, high-capacity biofiltration-type trickling filter plant provides high degree of treatment for sewage at project in northern Indiana; description of plant and equipment.

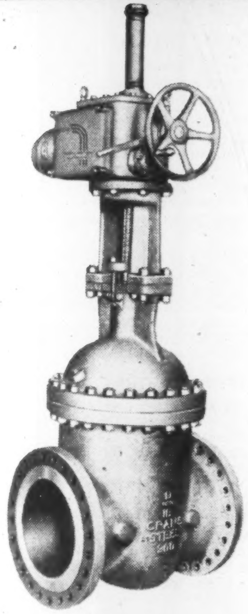
United States. Discharge of Raw Sewage—Important Sanitary Problem—U.S.P.H.S. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no.

No Maintenance Problem [illegible]

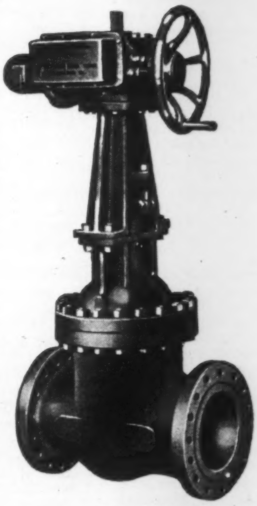
PHILADELPHIA LIMITORQUE VALVE CONTROLS

That LimiTorque Controls [illegible] practically no need for [illegible] fact well known by the [illegible] Sewage Disposal Plants using [illegible] and close valves, sluice gates [illegible] equipment. This dependability [illegible] sures immediate and proper function [illegible] time, regardless of the operating [illegible] or whether they are installed indoors or outdoors.





Type S

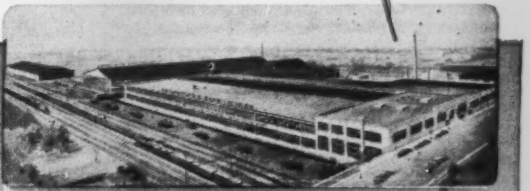


Type M

LimiTorque Controls are made in many types, to fit all applications. Convenient push button stations can be installed close to the equipment and/or operation can be from a centrally located master control panel. This latter arrangement provides a constant and accurate knowledge of the status of all important valves throughout the plant at all times and allows the important operation of valve control to be handled easily, quickly and safely by responsible key workmen.

LimiTorque Controls are applicable to all types and sizes of valves and can be adapted to existing equipment. Floor Stand Controls similar to those shown above can be furnished where it is not practical to fit the controls directly to the valve yokes.

ARMY E NAVY



Philadelphia GEAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

5, May 1944, pp. 234–236 and 256. Tables from Reprint No. 2363, Public Health Reports, showing state-by-state data on sewer systems in service and methods of raw sewage disposal; sewage treatment methods, both primary and secondary; chlorination of sewage; sludge processing and disposal.

Wartime Treatment Problems. Wartime Operating Problems in Municipal and Army Sewage Treatment Plants, R. Eliassen, M. A. Milling, E. C. Cardwell, and W. J. Downer. *Sewage Works J.*, vol. 16, no. 2, Mar. 1944, pp. 363–372. Symposium presented at conference of Federation of Sewage Works Assns.

Water Pollution. Stream Pollution Problems of Tennessee Valley, W. G. Stromquist. *Paper Trade J.*, vol. 118, no. 21, May 25, 1944, pp. 42–44. Survey conducted by Tennessee Valley Authority, in cooperation with other agencies, reveals that more than one-half of pollution load originates from small number of pulp, paper, and rayon plants; Authority's policy is one of cooperation with state, other Federal agencies, and industry in program of pollution abatement and control; one instance of cooperation with paper industry is cited. Before Tech. Assn. Pulp & Paper Industry.

SEWERAGE AND SEWAGE TREATMENT

Activated Sludge. Three Years' Operation of Gary Indiana, Activated Sludge Plant, L. R. Howson and W. W. Mathews. *Water Works & Sewerage*, vol. 91, no. 4, Apr. 1944, pp. 143–150. Review of operation of plant, with discussion of effect of iron wastes, including ferrous sulfate and cutting oil, on process and plant operation.

Flocculation. Effect on Solids Removal of Sewage Characteristics, H. W. Gehm. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 4, Apr. 1944, pp. 181–183. Characteristics of domestic sewage as related to clarification obtainable by pre-flocculation.

Maintenance and Repair. Wartime Maintenance Problems of Municipal Sewer Systems, J. H. Brooks, Jr. *Eng. & Contract. Rec.*, vol. 57, no. 11, Mar. 15, 1944, pp. 17–18. Difficulties encountered due to wartime operation of public sewer systems, among which are greater volume of industrial wastes and shortages of manpower and materials.

Treatment Plants, Hannibal, Mo. Hannibal Changes Sewage Disposal Methods, G. W. Farrell. *Pub. Works*, vol. 75, no. 3, Mar. 1944, pp. 23, 42. Brief description of project carried out at Hannibal, Mo.; raising of diluting river by dam submerged sewer outlets and necessitated pumping sewage; up to twice dry-weather flow is given primary treatment; excess is bypassed to river; sludge is digested.

STRUCTURAL ENGINEERING

Columns, Buckling. Note on Inelastic Buckling, N. J. Hoff. *J. Aeronautical Sciences*, vol. 11, no. 2, Apr. 1944, pp. 163–164. Equations given which utilize empirical short-column formulas developed by Timoshenko, Osgood, and Lundquist. Bibliography.

Roof Trusses, Wooden. Long Span Wood Roof Trusses for War Plant. *Architect & Engr.*, vol. 156, no. 2, Feb. 1944, pp. 14–15. Brief description of trusses, treatment of wood to minimize shrinkage, tests, and method of lifting trusses into place at new Ryan Aeronautical Company plant.

Roof Trusses, Wooden. Four Truck-Crane Works as Team to Place 20-Ton 200-Ft Timber Trusses. *Construction Methods*, vol. 26, no. 4, Apr. 1944, pp. 83 and 114. Cranes used to place on walls 35-ft high, 20-ton timber trusses of 200-ft span for new building at plant of Ryan Aeronautical Co., San Diego, Calif.; main problem in lifting trusses was that of avoiding excessive distortion or overloading of individual members.

Wooden Construction, Connectors. Timber-Connector Joints, Their Strength and Design, J. A. Scholten. *U. S. Dept. Agriculture—Tech. Bul. No. 865*, Mar. 1944, 106 pp., 20 cents. Design data for split ring, toothed ring, and claw plate connectors in various sizes when used with different species of wood; analysis of various factors which affect strength of connector joints.

SURVEYING

Aerial Photography, Mapping. Planning and Mapping—1944, R. W. Jones. *Excavating Engr.*, vol. 38, no. 4, Apr. 1944, pp. 178–181, 218. Aerial topographical surveys prepared from photographs taken from airplanes used as quicker, more accurate method of surveying and computing quantities of material involved in excavations and earthworks.

Aerial Photography, Mapping. Value of Air Photographs in Solving Civic Problems. *Pa. State Planning Board—Pa. Planning*, vol. 9, no. 3, Feb. 1944, pp. 9–14. Letter from chairman of Crawford County Commissioners, explaining various aids and economies developed in County through use of air photographs.

TUNNELS

Construction. Tunnel Construction in Soft Ground, O. S. Bray. *Eng. News-Rec.*, vol. 132, no. 16, Apr. 20, 1944, pp. 544–548. Tunnel with 8-ft inside diameter built through soft clay below tidal river; compressed air used without shield; lining, consisting of 15 in. of plain concrete inside light steel liner plate, constructed primarily by hand; shafts sunk almost entirely as open caissons, air work being required only for final section of one shaft.

WATER PIPE LINES

Construction. Safety in Water Main Construction, F. Eitel. *Am. Water Works Assn.—J.*, vol. 36, no. 5, May 1944, pp. 542–545. Precautions to be taken in construction of mains; discussion includes safety of workmen, safety to consumer in supplying them with safe and potable water, and safety of materials. Before New Jersey Section, Am. Water Works Assn.

Design. Factors Involved in Design of Water Distribution Systems, W. D. Hurst. *Water & Sewage*, vol. 82, no. 5, May 1944, pp. 47–48, 78, 80, 82, 84, 86, 88, 90. Procedure to be followed in design is outlined, after quantity of water required and necessity for, and kind of, storage have been determined. Bibliography. Before Am. Water Works Assn.

WATER RESOURCES

Conservation. Water-Waste Survey for Quebec's Gravity Supply, E. S. Cole. *Water & Sewage*, vol. 82, no. 4, Apr. 1944, pp. 22–23, 47–48. Water waste survey made by Pitometer Company from Aug. 16, 1943, to Dec. 4, 1943, had following results: leaks wasting over 6 million gal per day located, and 5 million gal per day of leakage repaired; total consumption of city decreased by at least 3 million gal per day; pressures in parts of system increased from 5 to 30 lb per sq in.

Hygiene. Sanitation Manual for Public Ground Water Supplies. *Am. Water Works Assn.—J.*, vol. 36, no. 5, May 1944, pp. 501–534. Manual recommended by U.S. Public Health Service for guidance of states, municipalities, and health districts in order to encourage greater uniformity and higher level of safety in sanitary control of public ground-water supplies.

Irrigation. Water Facilities Program in War Effort, H. F. McColly. *Agric. Eng.*, vol. 25, no. 2, Feb. 1944, pp. 43–44. Brief discussion of water facilities program of U.S. Dept. of Agriculture; program includes only those types of water facilities which make it possible for farmers and ranchers to store or utilize water for livestock, crop, and hay lands, ranges and pastures, farm gardens, domestic water, and other agricultural purposes. Before Am. Soc. Agric. Engrs.

Mines and Mining. Treasury Tunnel. *Min. Congress J.*, vol. 30, no. 1, Jan. 1944, pp. 18–20. Illustrations and brief notes on tunnel being driven to reach workings of Black Bear mine in San Miguel County, Colorado; see more complete description by C. H. Vivian, previously indexed from *Compressed Air Mag.*, Jan. 1944.

Water Pollution. Water Superintendent's Interest in Sewage Treatment, R. E. Bonyun. *Water Works & Sewerage*, vol. 91, no. 5, May 1944, pp. 178–179. Passaic Valley watershed commission maintains watershed patrol to watch for sewage-treatment operations that might have effect on water supply.

Water Supply, Washington. LaGrande Tunnel. *Pac. Bldr. & Engr.*, vol. 50, no. 5, May 1944, pp. 64, 66, 68, 70. Methods used by West Construction Company in drilling 6,400-ft tunnel through andesitic and gravel formations to connect La Grande Dam and power house; one 365-ft section of tunnel is located on 45-deg. angle; section beneath bed of Nisqually River is built from open cut; design; excavation; concrete lining; addition to power house; care of equipment; personnel; engineering.

WATER TREATMENT

Activated Carbon. Activated Carbon in Canadian Water-Treatment Practice. Comparison with United States Usage, A. E. Barry. *Water & Sewage*, vol. 82, no. 4, Apr. 1944, pp. 24–25, 58, 60. Comparison of usage in United States and Canada; tabular data on use of activated carbon in Canadian plants during 1942 giving amount used, cost, dosage, number of days used, and percentage of water treated; also where and how fed, reasons for use, and results obtained.

Chlorination. Super-Chlorination of Missouri River Water, R. F. Bishop. *Pub. Works*, vol. 75, no. 3, Mar. 1944, pp. 11–12. Applying chlorine past breakpoint was found to eliminate high color, taste, and odor conditions of Missouri River water, which had resisted other treatment methods; method of treatment and application described.

Filtration. Applying Chemicals and Mixing. *Water Works Eng.*, vol. 97, no. 6, Mar. 22, 1944, pp. 295, 321. Discussion of solution and dry-feed methods of adding chemicals to water, amount to be added, and proper mixing methods to produce maximum amount of floc.

Filtration. Mixing and Flocculation. *Water Works Eng.*, vol. 97, no. 7, Apr. 5, 1944, pp. 350–351. Description of process of mixing chemicals with water to be filtered and development of floc with illustration from treatment plant at St. Paul, Minn.

Filtration. Mechanical Filtration of Water for Industrial and Domestic Purposes, J. D. Joseph. *Machy. Market*, nos. 2264 and 2266, Mar. 24, 1944, pp. 113–115, Apr. 7, p. 136. Sources; filtration; slow sand filtration; construction of filters; filtration and washing; pressure filtration; vertical type filter. Before Manchester Assn. Engrs.

Filtration Plants, Buffalo, N.Y. Buffalo Filter Experience Upholds Surface Wash, A. D. Drake. *Water Works Eng.*, vol. 97, no. 8, Apr. 19, 1944, pp. 397–398. Treatment plant contains 40 filter beds of 4-mgd capacity each; because of mud-ball difficulties, eight beds were altered by installing moving surface wash system and Antrafilt sand; satisfactory results recorded, with filter runs nearly doubled.

Fluorine. Brantford Plans Addition of Fluorine to Water Supply. *Eng. & Contract, Rec.*, vol. 57, no. 16, Apr. 19, 1944, pp. 58–59. Brantford, Ontario, will become first city in Canada to add fluorine to its water supply in experimental effort to reduce dental decay; one part per million will be added on recommendation of local Board of Health. Reprinted from report by Branford Board of Health.

Industrial Plants, Drinking Water. Pure Drinking Water for Employee Health, M. A. Nussbaum and R. M. Striger. *Factory Mgmt. & Maintenance*, vol. 102, no. 2, Feb. 1944, pp. 136–138. General recommendations of U.S. Public Health Service for protection of ground-water supplies; how contamination occurs; drinking water standards approved by U.S. Public Health Service and American Standards Assn.

Jackson, Miss. Insufficient Backwashing Facilities Necessitate Remodeling Tan Filters, B. F. Wade. *Pub. Works*, vol. 75, no. 4, Apr. 1944, pp. 23–24. Methods used in remodeling filters in water works at Jackson, Miss.; air washing discontinued, new strainers installed, larger troughs, set at higher elevation, and wash-water taken from high-pressure pumps were remedies adopted.

Taste and Odor Control. Weston Solves Taste Problems by Aeration, E. V. Manser. *Eng. & Contract, Rec.*, vol. 57, no. 16, Apr. 19, 1944, pp. 48–50. Illustrated description of electrically operated and automatically controlled aeration system installed by town of Weston, Ontario, which has proved successful and has solved difficult mineral taste problem; aeration accomplished by compressed air supplied at 8-lb pressure into aeration tanks.

Treatment Plants, Edmonton, Alberta. Edmonton's New Water Softening and Filtration Plant. *Water & Sewage*, vol. 82, no. 4, Apr. 1944, pp. 17–19, 52–53, 60. New plant, authorized in order to increase capacity for war needs, designed for same treatment as used at present, will have capacity of 15 mgd.

Water Filtration. Mechanical Filtration of Water, J. D. Joseph. *Mech. World*, vol. 115, no. 2990, Apr. 21, 1944, pp. 433–437. Description of equipment for slow sand, rapid gravity, and pressure processes.

Water Filtration, Strainers. Straining Plant for Water and Effluents, P. L. Boucher. *Civ. Eng.* (London), vol. 38, no. 450, Dec. 1943, pp. 262–266. Brief review of straining problems for potable and industrial waters; types of straining material classified and discussed; new automatic fixed and rotary strainers illustrated and described.

Williston, N.Dak. Williston's Mobile Water Intake, W. H. Robinson. *Pub. Works*, vol. 75, no. 3, Mar. 1944, pp. 21–22. Vagaries of Missouri River at intervals left intake inland and recently threatened to wash it away; remedies adopted by City of Williston for overcoming both difficulties are discussed.

WATER WORKS ENGINEERING

British Columbia. Treatment of Two Water Systems Under Joint Administration, E. H. Valentine. *Water & Sewage*, vol. 82, no. 4, Apr. 1944, pp. 26–27, 48, 50–51. Description of water systems of city of North Vancouver and district of North Vancouver, British Columbia, and problems of setting up suitable water-treatment system.

Camps, Military. Army Post Water Plant Operation in Seventh Service Command, C. A. Obma. *Am. Water Works Assn.—J.*, vol. 36, no. 4, Apr. 1944, pp. 454–462. Problems and methods of operation of water works at military camps.

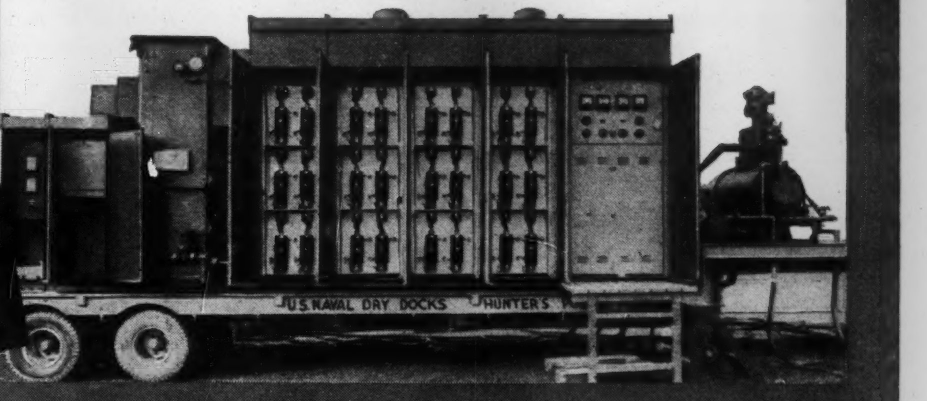
London, England. London's Water Supply, H. Berry. *Roy. Soc. Arts—J.*, vol. 92, no. 4661, Mar. 17, 1944, pp. 186–195, (discussion) 196–198. Author deals with area known as "Water London," which is one supplied by Metropolitan Water Board; sources of London's water supply; introduction of slow sand filtration; chlorination; storage reservoir and pumping plants.

Quebec. Postwar Projects in Quebec, R. Cyr. *Water & Sewage*, vol. 82, no. 4, Apr. 1944, pp. 54–58. Survey of plans of various municipalities in connection with postwar sanitary projects.

Water Tanks and Towers, Wooden. Large Water Storage Tank Built of Timber Construction. *Eng. & Contract Rec.*, vol. 57, no. 4, Jan. 26, 1944, pp. 14–15. Illustrated description of water-storage tank of 200,000-gal capacity built at Tacoma, Wash.; built with split-ring connectors.

Putting D-c on Wheels for Ships in Drydock

The story of a new portable rectifier that brings d-c power to ships in a-c yards



by C. P. Hamilton

Industrial Engineering Division
General Electric Company

Under the stimulus of war requirements, several new types of portable power units have been developed. It is very probable that this equipment will find a wide application in the construction industry. Here's a unit developed recently for the Navy.

ONE of the expensive obstacles to servicing ships in drydock has been the lack of d-c power *where it was needed.* Because ships under repair cannot furnish their own d-c power, and most shipyards use only a-c, the problem became acute early in the war when an increasingly large number of ships had to be serviced quickly—and at the same time.

Conversion at a centrally located point meant using miles of heavy copper conductors, and many large receptacles. The excessive use of scarce material and man power made this economically inadvisable.

The solution of this problem is a portable rectifier that can be moved close to where d-c power is needed. Mounted on a trailer, the entire equipment weighs 20 tons. In the installation shown here, the deck is 25 feet long by 8 feet wide. Additional area on the gooseneck provides space for part of the cooling system, and for storing cable, hose, platform, and steps when moving the rectifier to new locations. Screw jacks are provided to support and level the gooseneck end.

The rectifier illustrated above has served several famous ships. It converts 500 kw a-c to d-c by means of sealed ignitrons. As shown in the picture, component parts (from left to right) are:

Incoming line compartment
Circuit breaker
Control transformer compartment
Forced Pyranol-cooled transformer
Rectifier units mounting ignitrons
Direct-current control unit with electrically operated air circuit breaker
Two heat exchangers, one for the rectifier cooling water, and the other for the transformer Pyranol.

Equipment Features

1. The rectifiers and transformers are water cooled—in this dock installation, salt water is delivered to the heat exchangers by the dock pumps. The distilled water from the rectifier is circulated through its heat exchanger by its own vertical circulating pump.
2. Entire equipment is salt-air and corrosion resistant.
3. A special disconnecting device is used to attach incoming a-c line cable to the compartment on the left. Cables from the d-c distribution section at right are bolted from below directly to the bus bars in the d-c cubicle. (Bus bars are provided also for parallel connections.) These provisions make it possible to move the rectifiers from one location to another with little loss of time.

In developing this portable unit for shipyards, G.E. has also made another contribution to the construction industry. Mobile units for generating and distributing electric power will be needed to capitalize the great advantages of electrified construction machines. G.E. has developed such mobile units—a-c and d-c—which will safely speed construction work by providing electric power wherever it is needed. General Electric Co., Schenectady 5, New York.

Buy all the **BONDS** *you can—and keep all you buy*

GENERAL ELECTRIC

655-38-880

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain articles from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Approaches, Raising by Crane. Gantry Used to Raise Bridge Approaches. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, pp. 799–801. In changing level of long highway bridge crossing Tennessee River valley, gantry crane was used to raise 90-ft sections of approach viaducts until viaduct supports were rebuilt, by adding about 25 ft to height of towers, then lowering sections into final positions.

Concrete, Demolition. Heben einer gesprengten Stahlbetonbruecke, W. Juen. *Bauingenieur*, vol. 23, no. 345–36, Sept. 5, 1942, pp. 265–266. Lifting of blasted bridge; bridge discussed was reinforced concrete arch construction with three spans and length of 75 m; as new bridge was to be constructed on another site, concrete piers had also to be removed; work was carried out by blasting and cutting underwater and raising broken parts with floating dredge; considerable saving in time and expense is claimed; success, however, is dependent on employment of experienced divers.

Concrete, Germany. Baustelleneinrichtung beim Bau einer Reichsautobahnbruecke, J. Jaklin and R. Krug. *Bauingenieur*, vol. 23, no. 31/32, Aug. 5, 1942, pp. 227–232. Illustrated description of field equipment and layout for construction of bridge on German superhighway (Reichsautobahn); viaduct, spanning valley, is 45 m high and 450 m long, with eight spans of 25 m each; it is constructed of rammed concrete faced with natural stone; details of concrete mixing and handling, quarry, and materials-handling equipment.

Concrete Girder. Construction Details of Morganza Floodway Bridge, N. E. Lant. *Concrete*, vol. 52, no. 6, June 1944, pp. 2–5 and 8. Brief account, by bridge design engineer, of structure built to carry relocated U.S. Highway 190 in Louisiana.

Military. Portable Steel Highway Bridges H-10 and H-20. *U.S. War Dept.—Tech. Manual TM 5-274*, June 18, 1943, 53 pp., 15 cents. Illustrated description of bridge that may be quickly erected over gaps not wider than 96 ft; bridge is timber deck on two or more deck-type box trusses of high grade steel, cantilevered into position on rollers; table of calculated safe crossing weights is included; notes on equipment, task, and army personnel.

Railroad. Traveling Gantrys Build Railroad Trestle. *Eng. News-Rec.*, vol. 132, no. 20, May 18, 1944, pp. 740–744. 19,000-ft concrete bent and girder railroad trestle over alluvial silt of floodway built from traveling gantrys spanning entire work and moving on rails laid on embankments made from footing excavation.

Railroad, Maintenance and Repair. Revamps Old Truss for Use at New Site, C. E. Jacobson. *Ry. Eng. & Maintenance*, vol. 40, no. 6, June 1944, pp. 527–528. Through-truss span that had been released from abandoned line on Georgia railroad was adapted for reuse to replace burned-out bridge by shortening it to increase load rating and by converting it to deck-truss span to adapt it to new location; manner in which conversion was effected is described.

Steel Truss, Reconstruction. Bridge Damage by 1943 Flood Reconstructed, E. H. Krehbiel. *Construction Advisor*, vol. 16, no. 5, May 1944, p. 86. Description of method of reconstruction after impact of debris, drift, etc., due to flood, caused pier supporting 190-ft steel truss spans to tilt and become displaced at top.

Suspension, Vibrations. Die Lotrechten Eigenschwingungen der Hangebruecken, K. Kloeppel and K. H. Lie. *Bauingenieur*, vol. 23, no. 37–39, Sept. 20, 1942, pp. 277–283. Vertical natural vibrations of suspension bridges; simple formulas for calculation, developed and applied.

BUILDINGS

Building Materials, Light Metals. Light Alloys in Future Building Construction, G. C. Wright. *Light Metals*, vol. 7, no. 76, May 1944, pp. 214–216. Discussion of modern light metal, dry technique, unit constructed houses; foundations; structural frame; scaffolding; external cladding; roof; floors and stairs; paint and decorations.

CIVIL ENGINEERING

Review, 1943. Civil Engineering in 1943. *Engineer*, vol. 177, nos. 4592, 4593, Jan. 14, 1944, pp. 22–24, Jan. 21, pp. 55–57. Review of developments in roads, bridges, and tunnels, docks and harbors, water supply, and sanitary works.

CITY AND REGIONAL PLANNING

London, England. London Plans City of Future, H. V. Lanchester. *Nat. Mun. Rev.*, vol. 33, no. 3, Mar. 1944, pp. 133–137 and 158. Governmental authorities and professional and welfare groups cooperate to study traffic congestion and develop better housing, open spaces, ideal location of homes and industry; plans compared; remedies for defects; traffic plans.

New York. Early Town Planning in New York State, T. C. Bannister. *Landscape Architecture*, vol. 34, no. 2, Jan. 1944, pp. 45–49. Purpose of article is to consider foundation and early growth of number of New York State communities during Colonial and Early Republican periods; Dutch, English, and early American citizens each evolved different character in their towns quite independent of their highly differentiated styles of building; this difference of character is all the more intriguing because influences of geography and climate remain relatively constant.

CONCRETE

Barges. Production of Concrete Barges. *Engineer*, vol. 177, no. 4603, Mar. 31, 1944, pp. 253–254. Barges described are built up from pre-cast sections, which are made at places away from site at which barges are assembled; these sections are cast in molds and are electrically vibrated during setting process; yard described has 37 building berths; when in full production, 10 barges per week may be turned out.

Construction, Cold Weather. Protecting Concrete in Sub-Zero Weather. *Concrete*, vol. 52, no. 6, June 1944, pp. 18 and 31. In construction of MacArthur Lock on St. Mary's Falls Canal at Saulte Ste, Marie, Mich., work was carried on practically continuously throughout 14-month construction period; air temperatures varied between maximum of 90 F and 33 F below zero; construction notes, with special attention to pump placing of concrete, protective huts, and use of electric steam blowers.

Construction, Pump Placing. Concrete Using Air-Entraining Cement Pumped 1,100 Ft on Chicago Pier. *Concrete*, vol. 52, no. 4, Apr. 1944, pp. 10 and 16. Illustrated description of job that included cutting piles of old pier below water line, filling between two lines of piles with riprap, capping with stone blocks, providing concrete beams above each line of piling, and consolidating capstones into series of monoliths by filling joints between capstones; for all concrete work air-entraining portland cement was used, and this was pumped from shore end of pier.

Design. Application of Theory of Probability to Design of Concrete for Strength, S. Walker. *Concrete*, vol. 52, no. 5, May 1944, pp. 3–5. Mathematical discussion; determination of coefficient of variation in batch tests; comparison of field data with normal law; outline of estimates based upon probability; accuracy increases with number of tests involved.

Hangars, Design. Unusual Design of Concrete Flight Hangar, C. A. Mitchell. *Concrete*, vol. 52, no. 6, June 1944, pp. 10–11, 30. Hangar at Buffalo, N.Y., airport was built according to designs and under supervision of U.S. Engineer Dept.; directive authorizing construction called for seven units and two one-story lean-tos, latter being 30 ft wide and 200 ft long; scarcity of both steel and lumber were strong influences in selection of reinforced concrete as medium of construction; other details, with illustrations.

Ready-Mixed, New York. Concrete Firm Exercises Painstaking Care in Proportioning of Materials. *Pit & Quarry*, vol. 36, no. 11, May 1944, pp. 152–154. Features of equipment and practice at plant in Rochester, N.Y.

Roads and Streets. Reinforcing Steel in Concrete Pavements, R. D. Bradbury. *Concrete*, vol. 52, no. 2, Feb. 1944, pp. 19 and 23. Structural design of concrete pavements must be predicated upon probability of erratic cracking regardless of any slab dimensions that may be provided within limits of reasonable economy; joints serve merely as means of obtaining certain degree of crack limitation, not crack control; types of steel reinforcing members; distributed reinforcement design; placement.

Tanks. Coating Concrete Storage Tank Interiors, C. B. Taylor. *Concrete*, vol. 52, no. 3, Mar. 1944, pp. 4–6. Prestressed concrete tanks are now being used extensively for storage of fuel and Diesel oil and aromatic gasoline; as precaution against leakage, to seal pores of concrete and to prevent contamination of gasoline, tanks are lined, nature of lining depending on fuel stored; "Thiokol" synthetic latex for gasoline tanks; sodium silicate lining for fuel oil tanks; "Amercoat" and other synthetic resin linings, applied with spray painting equipment; other types of lining.

DAMS

Concrete Arch, Arizona. Parker Dam. *Engineer*, vol. 177, nos. 4600 and 4601, Mar. 10, 1944, pp. 185–188, Mar. 17, pp. 204–206. Dam reared for primary purpose of impounding flow of Colorado to produce stilling basin from which water could be diverted by pumping into Colorado aqueduct; it is of constant radius-arch type constructed of concrete; illustrated description.

Earth. Denison Dam, C. H. Vivian. *Compressed Air Mag.*, vol. 49, no. 5, May 1944, pp. 110–117. Illustrated description of principal features of largest rolled-filled earth dam ever built in United States; it contains 18,385,000 cu yd of earth, all of which was excavated, hauled to site, spread, scarified, sprinkled, and rolled; it was designed primarily to control floods in Red River, which drains sections of Texas, Oklahoma, Arkansas, and Louisiana; watershed above dam covers 38,290 sq miles; second purpose of development is hydroelectric power generation.

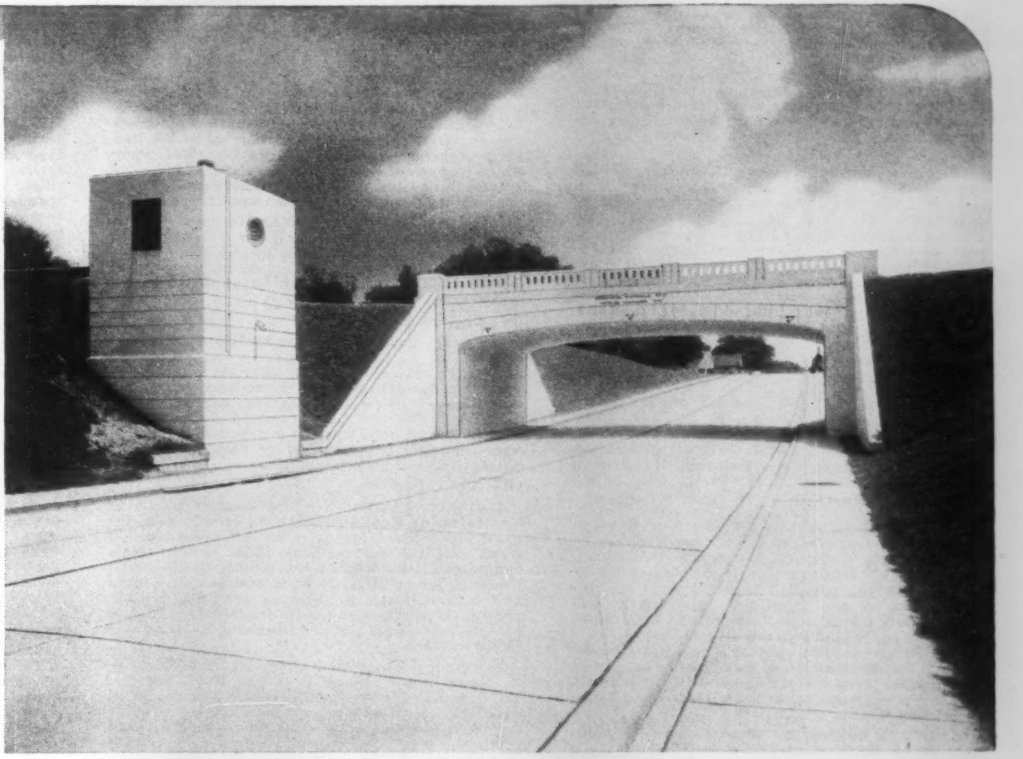
Gravity, Oklahoma. Masonry-Faced Dam—First Stage of Altus Dam Completed, W. S. Byrne. *Western Construction News*, vol. 19, no. 5, May 1944, pp. 63–69. Design and construction of Altus dam which will provide storage of 163,000 acre-ft for irrigation, flood control, and domestic water supply; demolition of old Ambursen Dam; foundation clean-up and grouting; concrete materials—manufacturing, handling, and placing; masonry handling and placing; river outlet gates.

Spillways, Design. Hydraulic Design of Rectangular Spillways. U.S. Soil Conservation Service. Prepared by A. N. Huff, under direction of C. E. Ramser. Minneapolis, Feb. 1944, 64 pp., illus., tables, diagrs. Description of structure with its application to field conditions; brief descriptions of laboratory tests and analysis of data; method used in preparing rating tables for designing spillway, and effect of various features of spillway design on carrying capacity, including correction to be applied for spillways subject to submerged conditions.

FLOOD CONTROL

China. Sediment Research Needed for Solution of China's Flood Problems, E. W. Lane. *Chinese Inst. Engrs.—J.*, vol. 2, no. 1, May 1944, pp. 105–107. It is emphasized that while different methods have been proposed for control of flood in China such as by use of retarding basins or by narrowing and straightening channels, until more research on sediment transportation and deposition is carried out, it will not be possible to select best method.

Mississippi River. Army Engineers Fight 100-Year Mississippi Flood, V. T. Boughton. *Eng. News-Rec.*, vol. 132, no. 20, May 18, 1944,



Tax Money Well-Spent!

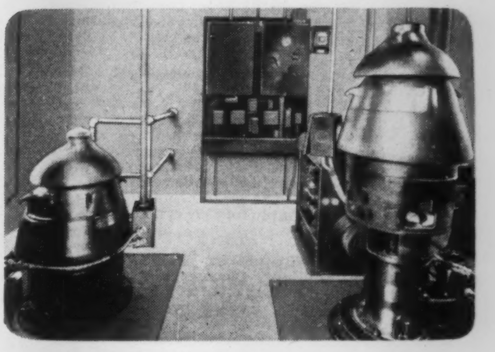
The Florida State Road Department took no chances in building this highway underpass at Cottondale, where the terrain is as flat as a billiard table.

They knew in advance that there must be efficient and reliable provision for pumping out water as rapidly as it gathered from heavy rainfall.

Fairbanks-Morse engineers were called in on the problem and solved it. The result is two 8-inch Fairbanks-Morse Vertical Centrifugal Pumps, driven at 900 r.p.m. by Fairbanks-Morse 20-hp. Vertical Ball Bearing Motors.

The entire system is turned on and off automatically.

If your municipality has pumping problems now, or if you are planning for the future, why not consult with Fairbanks-Morse engineers? Write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.



Here are the two 8-inch Fairbanks-Morse Vertical Centrifugal Pumping Units that keep the Cottondale underpass free from water during the heaviest rainfalls. Unit at right also connects to auxiliary gasoline engine that assures pumping during power failure emergency.

BUY
MORE BONDS

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Pumps

pp. 748–753. Floods of magnitude not exceeded in 100 years attacked several hundred miles of levees that protect nearly 1,000,000 acres of rich bottom lands in Mississippi, Missouri, and Illinois River valleys in Illinois and Missouri; all but 150,000 acres in St. Louis District of U.S. Engineer Dept. were saved from inundation through operation of efficient flood-fighting organization set up on basis of last year's experience.

RUBIO CANYON PROJECT. Important Flood Control Project Concluded Successfully With Help of Diesel Equipment, M. D. Pugh. *Diesel Power*, vol. 22, no. 5, May 1944, pp. 478–479. Details of Rubio Canyon Flood Control Project, part of county-wide flood-control plan inaugurated by Los Angeles County, Calif., which is designed to protect lives and property from water and debris sweeping down from adjoining mountain sides when there are excessive rainfalls; Diesel-powered earthworking equipment was used extensively in process of construction of dams, spillways, and earthworks.

FLOW OF FLUIDS

PITOT TUBES. Application of Pitometer to Water Distribution Systems, E. S. Cole. *New England Water Works Assn.—J.*, vol. 58, no. 1, Mar. 1944, pp. 74–83. Review of application of Pitometer in water-waste survey, trunk-main survey, and water-distribution study.

FOUNDATIONS

BEARING CAPACITY. Anregung zur Berechnung der Bodenreaktionen und der Kippsicherheit ausmittig lastender Massivgrundwerke, H. G. Schuette. *Bauingenieur*, vol. 23, no. 29/30, July 20, 1942, pp. 213–218. Suggestions for calculation of soil reactions and stability of eccentrically loaded solid foundations with aid of boundary earth cleavage conditions derived from classic earth-pressure theory; calculation developed for distribution of soil-bearing pressures; permissible pressures are dependent upon form and depth of foundation as well as upon characteristics of soil.

BRIDGE ABUTMENTS. Praktische Ausfuehrungen von Gitterwand-Brueckenwiderlagern, A. Schroeter. *Bauingenieur*, vol. 23, nos. 37–39, Sept. 20, 1942, pp. 283–289. Practical designs of trellis work bridge abutments; static principles of lattice work; rules governing practical design of single stage lattice work abutment walls; multiple stage design.

PILE. Design of Wharves on Soft Ground, H. D. Morgan. *Instn. Civ. Engrs.—J.*, vol. 22, no. 5, Mar. 1944, pp. 5–25, (discussion) 25–45, 1 supp sheet; see also *Engineer*, vol. 177, nos. 4597 and 4598, Feb. 18, 1944, pp. 136–138, Feb. 25, pp. 157–159. One of major problems is that of designing suitable foundations for heavy loading involved in cases where no hard stratum is found at reasonable depth; discussion of driven piles; composite piles; practical problems that arose during construction of screw pile and cylinder wharves; sheet-pile wharves.

PILE. Some Considerations in Construction of Pile Foundations, J. R. Burkey. *Western Soc. Engrs.—J.*, vol. 49, no. 1, Mar. 1944, pp. 15–28. Function of foundation; investigation preliminary to foundation design; selecting pile type; bearing capacity of piles.

SOILS, STABILIZATION. Stabilized Earth Blocks for Protective Construction, R. G. Hennes. *Wash. Univ.—Eng. Experiment Station—Bul. No. 111*, July 1943, 24 pp. Report presents test results which indicate that earth block can be made to meet requirements for construction of revetments; data justify conclusion that well-graded soil with admixture of fiber and adhesive, properly compacted and waterproofed, will produce earth block suitable for this type of service.

HYDRAULIC ENGINEERING

SILT. Meue Erkenntnisse zum Geschiebe-Problem, R. Winkel. *Bauingenieur*, vol. 23, no. 29/30, July 20, 1942, pp. 211–213. Recent progress in study of detritus problem; report from hydraulic laboratory of Danzig Institute of Technology on examination of samples taken from bed of river on Pomeranian coast over length of 100 km and also from 35-km section of tributary river; results of sieve analyses and other tests.

HYDROELECTRIC POWER PLANTS

SWITZERLAND. Les besoins d'énergie de la Suisse et l'aménagement des forces hydrauliques du Rhin postérieur, G. Lorenz. *Assn. Suisse des Electriciens—Bul.*, vol. 34, no. 23, Nov. 17, 1943, pp. 695–701. Power requirements of Switzerland and utilization of water power of Rhine River with storage reservoir at Rheinwald; brief description of 1942 project and repercussions affecting population of Rheinwald; advantageous plan for transfer of expropriated inhabitants explained in detail.

HYDROLOGY AND METEOROLOGY

BEACHES, EROSION. Lake Erie Shore Erosion in Ohio. *Shore & Beach*, vol. 12, no. 1, Apr 1944, pp. 8–10. Location and description; irregular changes in level; geologic setting; rock outcrops are rare; erosion severe in cliffed section; no abundant sand source; erosion causes listed; $300,000 loss annually estimated; Lake Erie erosion bill; shore erosion studies; field studies being made. Summary compiled by G. W. White, Ohio State University, and Geological Survey of Ohio, from reports, mainly unpublished, in office of Dept. of Public Works, State of Ohio.

BEACHES, STORM DAMAGE. Long Island Hurricane Rehabilitation, H. T. Tuthill. *Shore & Beach*, vol. 12, no. 1, Apr. 1944, pp. 16–20. Effect of storm on Long Island coastline developed problems without precedent; conformation of beach was materially changed, and barrier beach had been breached in many places by tidal wave which had swept over it into bays, carrying before it sand dunes and structures that lay in its path; rehabilitation job undertaken; sand traps built.

RAIN AND RAINFALL, GREAT BRITAIN. Rainfall of 1943, J. Glasspoole. *Water & Water Eng.*, vol. 47, no. 575, Apr. 1944, pp. 157–159. Statistical data on average amount, incidence, and distribution of rainfall over Great Britain and northern Ireland.

INLAND WATERWAYS

RIVERS, IMPROVEMENT. Multiple Purpose Rivers, M. L. Cooke. *Franklin Inst.—J.*, vol. 237, no. 4, Apr. 1944, pp. 251–264. Need for planning in utilization of river and watershed potentials is stressed; author correlates industrial and agricultural needs and points out that most soil deterioration is result of misuse of river purposes; suggestions for best adaptations of watershed areas are included.

IRRIGATION

IRRIGATION CANALS, WEED CONTROL. Ditch Vegetation Is Removed Without Stopping Water Flow, W. E. Hartzog. *Western Construction News*, vol. 19, no. 5, May 1944, p. 74. New compound called Benoclor, produced by Cloroben Corp. of Jersey City, N.J., is said to cause moss and other growth to collapse and disintegrate; growth is carried away in fragments, and no harmful effects are noted on agricultural products being watered.

MEXICO. Water for Thirsty Lands of Mexico, A. Orive Alba. *Water & Water Eng.*, vol. 47, no. 575, Apr. 1944, pp. 160–165. Discussion of need for irrigation and efforts made to provide sufficient irrigation. Similar description indexed in Engineering Index from *Western Construction News*, Sept. 1943.

LAND RECLAMATION AND DRAINAGE

DRAINAGE CANALS, CONSTRUCTION. Blasting Ditches in Louisiana, W. R. Dowlen. *Explosives Engr.*, vol. 22, no. 2, Mar.-Apr. 1944, pp. 66–67 and 84. In False River area of east-central Louisiana, thousands of acres have been unworkable and non-productive because of lack of drainage; after preliminary trials, procedure was adopted for blasting ditches; holes were put down 18 to 24 in., spaced 18 to 20 in. apart, each loaded with two $1^1/_4$ by 8-in. cartridges of 50% nitroglycerin dynamite; most of blasts were made by propagated explosion method; tabulated data on five ditches.

DRAINAGE CANALS, CONSTRUCTION. Dehydrating a Bomber Base, F. R. Bussells. *Explosives Engr.*, vol. 22, no. 2, Mar.-Apr. 1944, pp. 62–63. Brief illustrated description of construction of three canals at Army Ferry Command Base at Homestead, Fla.; first step was to cut trench 4 ft wide and 10 ft deep with ditching machine on both outer sides of canal section; central cores were blasted by drilling $2^1/_2$-in. holes 10 ft deep, with spacings between holes on 4-ft centers; each blast was made with from 600 to 800 holes fired at one time, with loading ratio of 1 lb of dynamite to 1 cu yd of burden in solid.

DRAINAGE CANALS, CONSTRUCTION. Try-Again Method Makes Ditch Blast Success, H. L. Roach. *Explosives Engr.*, vol. 21, no. 6, Nov.-Dec. 1943, pp. 229 and 245. Application of ditch-blasting method, as described in paper indexed in Engineering Index 1942, p. 303, from issue of Sept. 1942; example of results obtained in draining 40-acre area in Bremer County, near Plainfield, Iowa.

MATERIALS TESTING

CEMENT TESTING. Reaction of Vinsol Resin as It Affects Air Entrainment of Portland-Cement Concrete, C. E. Wuerpel and A. Weiner. *Am. Soc. Testing Matls.—Preprint No. 53* for meeting, June 26–30, 1944, 3 pp. Results of investigation into nature of reaction between Vinsol resin and portland cement; cements with interground flake vinsol resin; addition of neutralized vinsol resin to mixing water; cements with interground neutralized vinsol resin.

CONCRETE AGGREGATES, STANDARDS. Report of Committee C-9 on Concrete and Concrete Aggregates. *Am. Soc. Testing Matls.—Preprint No. 47* for meeting June 26–30, 1944, 39 pp. Activities of subcommittees; Volumetric Method for Determining Air Content of Freshly Mixed Concrete, J. C. Pearson; making concrete specimens in laboratory and in field; tests for compressive strength of concrete cylinders, flexural strength, efficiency of materials for curing concrete, and surface moisture in fine aggregate; securing and testing specimens from hardened concrete.

CONCRETE CRACKING. Experiments in Repairing and Obscuring Cracks in Concrete Structures, C. C. Carlson. *Concrete*, vol. 52, no. 2, Feb. 1944, pp. 6–8. In studies made by Portland Cement Assn., as to possibilities of pressure grouting for filling and obscuring cracks, procedure has much in common with other grouting methods; it consists essentially of surface sealing, except at selected intervals where sho
lengths of crack are left open to provide for i
jection of cement grout; illustrated descripti
of principal steps in crack-repair procedure.

CONCRETE CURING. Recent Developments i
Testing and Use of Liquid Concrete Curing Co
pounds, R. E. Madison. *Concrete*, vol. 52, no.
Feb. 1944, pp. 2–5. Limitations of convention
curing; early liquid curing compositions; "clea
type curing materials; laboratory equipment f
testing of curing compounds; comparative r
sults; certain curing compounds when tested i
standard cabinet, show satisfactory water r
tention, but when tested under conditions of su
light, such as would be encountered under fie
operation, show up poorly in water retention.

ROAD MATERIALS, STANDARDS. Report
Committee D-4 on Road and Paving Materia
Am. Soc. Testing Matls.—Preprint No. 69 f
meeting June 26–30, 1944, 8 pp. New tentati
standard; adoption of tentative standards
standard; standards and tentative standar
continued without revision; test for hot extra
tion of asphaltic materials and recovery of bit
men by modified Abson procedure.

PORTS AND MARITIME STRUCTURES

PORT STRUCTURES. Deutsche Hafenbaute
fuer das Ausland, H. G. Schuette. *Bauingenieu*
vol. 23, no. 33/34, Aug. 20, 1942, pp. 243–25
German port structures for foreign countrie
illustrated description of design and constructi
of practically all harbor works in different parts
world, carried out by German engineers betwe
1918 and 1939; tabulated list giving name
harbor, date of construction, name of builder
type of structure, and other data. Bibliography

ROADS AND STREETS

ACCESS. Detroit Industrial Expressway E
gineering Provisions for High Speed Traffic,
C. C. Chang. *Chinese Inst. Engrs.—J.*, vol.
no. 2, Nov. 1943, pp. 217–224. Design and-co
struction of superhighway to connect Detro
with Ford's Rouge plant and Willow Run bomb
plant are described, particular attention bei
paid to grade-separation structures.

DESIGN. Traffic Arteries of Large City, H
Criswell. *Roads & Road Construction*, vol. 2
nos.. 255 and 256, Mar. 1, 1944, pp. 65–67, Ap
1, pp. 95–97. Relative merits of surface, el
vated, or subway type roads; definitions; note
presented as outline of principal consideratio
involved when attempting to weigh various a
vantages and disadvantages inherent in thre
types of traffic artery described.

HIGHWAY SYSTEMS, BRITISH COLUMBIA. Can
ada's Wartime Road, J. M. Wardle. *Eng. J*
vol. 27, no. 5, May 1944, pp. 280–284. Di
cussion of location, award of contracts, un
prices, and construction difficulties on Princ
Rupert Highway, from Prince Rupert to Hazel
ton, B.C.

HIGHWAY SYSTEMS, FLORIDA. Highway t
Key West, F. P. Bussells. *Explosives Engr.*, vo
22, no. 1, Jan.-Feb. 1944, pp. 18–19 and 40–41
Notes on building of Florida East Coast Railwa
extensions, completed in 1912; tornado damag
in 1935 and abandonment as railway; recon
struction as Overseas Highway started in 1936
construction progress; description of method
and procedure in building 30.315-mile sectio
between Key Largo and Lower Matecumbe Key
also 11.686-mile section between Grassy Key an
Key Vaca; final section will be 26.345 miles fro
Big Pine Key to Key West.

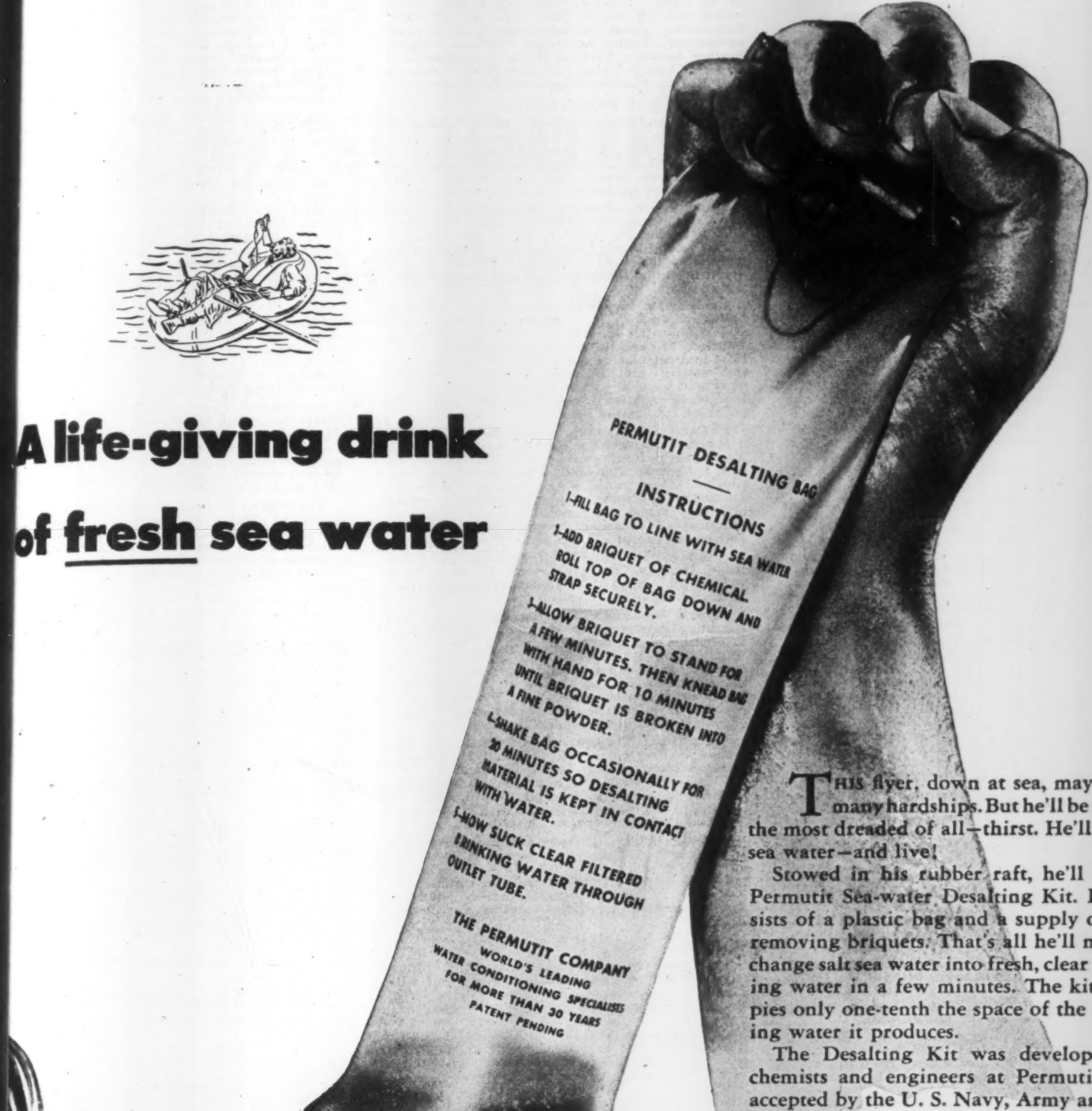
HIGHWAY SYSTEMS, PAN-AMERICAN. Inte
American Highway. *Engineer*, vol. 177, no
4602, Mar. 24, 1944, p. 234. Map shows rout
of this road from border of United States t
Panama and its state last April.

HIGHWAY SYSTEMS, PAN-AMERICAN. Ove
Hills and Far Away, J. L. Harrison. *Explosiv*
Engr., vol. 22, no. 1, Jan.-Feb. 1944, pp. 14–17
30–31. Notes on construction methods an
progress, between Texas and Panama; map an
some illustrations are same as in paper by sam
author, previously indexed from *Pit & Quarry*
Apr. 1944, but present description is in greate
detail.

HIGHWAY SYSTEMS, PERU. Peru's Ocean-To
Amazon Highway. *Compressed Air Mag.*, vo
49, no. 5, May 1944, pp. 131–132. Brief account
with maps; road extends from Lima, on Pacifi
Ocean, to Pucallpa on Ucayali River, tributar
of Amazon and navigable by small boats; tri
of 1,172 mi from Lima to Iquitos, port on Amazo
River, is now made in five days, two by automo
bile and three by boat.

HIGHWAY SYSTEMS, UNITED STATES. High
ways in United States, T. H. MacDonald. *Road*
& Road Construction, vol. 22, no. 255, Mar. 1
1944, pp. 75–76. Brief note on deterioration o
highways and bridges caused by increased fre
quency of use by heavier units, and curtailment
of replacements and adequate repairs, too drasti
for anything but all-out war conditions; futur
outlook. Before Am. Assn. State Highway
Officials.

INTERSECTIONS. Multiple Levels Aid Traffi
Interchange, R. H. Baldock. *Eng. News-Rec*
vol. 132, no. 18, May 4, 1944, pp. 678–679. Solu
tion of major vehicular traffic problem in Port
land, Ore., follows general plan of making im
portant interchanges from one main route to an
other by means of multiple-level method.


PERMUTIT DESALTING BAG
INSTRUCTIONS
1-FILL BAG TO LINE WITH SEA WATER
2-ADD BRIQUET OF CHEMICAL. ROLL TOP OF BAG DOWN AND STRAP SECURELY.
3-ALLOW BRIQUET TO STAND FOR A FEW MINUTES. THEN KNEAD BAG WITH HAND FOR 10 MINUTES UNTIL BRIQUET IS BROKEN INTO A FINE POWDER.
4-SHAKE BAG OCCASIONALLY FOR 20 MINUTES SO DESALTING MATERIAL IS KEPT IN CONTACT WITH WATER.
5-NOW SUCK CLEAR FILTERED DRINKING WATER THROUGH OUTLET TUBE.
THE PERMUTIT COMPANY
WORLD'S LEADING WATER CONDITIONING SPECIALISTS FOR MORE THAN 30 YEARS
PATENT PENDING

A life-giving drink of fresh sea water

This flyer, down at sea, may suffer many hardships. But he'll be spared the most dreaded of all—thirst. He'll drink sea water—and live!

Stowed in his rubber raft, he'll find a Permutit Sea-water Desalting Kit. It consists of a plastic bag and a supply of salt-removing briquets. That's all he'll need to change salt sea water into fresh, clear drinking water in a few minutes. The kit occupies only one-tenth the space of the drinking water it produces.

The Desalting Kit was developed by chemists and engineers at Permutit, and accepted by the U. S. Navy, Army and Air Transport Command.

Permutit is helping thousands of war plants and Army and Navy establishments to do a better war job. We are proud indeed that our skill enables us also to make the tough job of our front-line fighting men a little easier, a little safer.

The Permutit Co., Dept. A14, 330 West 42nd St., New York 18, N. Y. Permutit Co. of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.

PERMUTIT

Serving industry and the armed forces...with GOOD WATER

Railroad Crossings, Grade Separation. Grade Separation at Winnetka, Illinois, R. L. Anderson. *Western Soc. Engrs.—J.*, vol. 49, no. 1, Mar. 1944, pp. 29–41. Description of continuous railway highway grade-separation project 3.51 miles long, involving two adjoining railroads and costing $4,280,000, completed in 1942; history of undertaking previous to its construction.

Road Materials, Resin. Vinsol Resin Treated Cements and Their Use in Highway Construction, J. F. Barbee. *Concrete*. vol. 52, no. 1, Jan. 1944 (Cement Mill Sec.), pp. 103–104 and 108. Ohio Dept. of Highways laboratory and road tests in 1941 and 1942 led to specification requiring use of vinsol resin on all pavements; tests and experience indicate increased durability, as measured by resistance to freezing and thawing; strengths are decreased in proportion to increase in air content; problem is that of adjusting construction practices to characteristics of material.

Subsoils, South Africa. Some Structural Properties and Stability Characteristics of South African Soil Fines, H. M. Croeser. *Roads & Road Construction*, vol. 22, no. 255, Mar. 1, 1944, pp. 81–83. Object of investigation was to discover role played by soil fines in road subgrade, especially with regard to structural strength and supporting capacity; materials used were soils of low, intermediate, and high plasticities, and contained "clay fractions" derived from limestone, dolomite, granite, shale, limonite, dolerite, Fuller's earth, talc, and kaolin.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. Oxidation-Reduction Potential Measurements in Activated Sludge and Activated Sludge-Sewage Mixtures, G. A. Rohlich. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 540–557. Report of studies made of oxidation reduction potentials of sewage, activated sludges, and activated sludge sewage mixtures; study of redox potentials of sewage sludge mixtures in activated sludge sewage treatment plant at Madison, Wis., under ordinary operating conditions. Bibliography. Before Am. Chem. Soc.

Industrial Wastes. Volume Characteristics and Disposal of Laundry Wastes, H. W. Gehm. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 571–601. Purpose of paper is to evaluate effect of laundry waste on flow and character of municipal and institutional sewage, to determine at what percentage of waste, in relation to sewage flow, necessary pretreatment is indicated, what methods of pretreatment are practical, and by what method waste should be handled under different conditions. Bibliography.

Sewage Analysis. Determination of Settleable Sewage Solids by Weight, A. J. Fischer and G. E. Symons. *Water Works & Sewerage*, vol. 91, no. 1, Jan. 1944, p. 37. Proposed procedure which determines ppm by weight of settleable solids is outlined.

Sewage Filters. Recent Advances in Treatment of Sewage and Trade Effluents, B. A. Southgate. *Water & Water Eng.*, vol. 47, no. 575, Apr. 1944, pp. 168–69. Description of recent developments in use of percolating filters. Summary of paper before Roy. Inst. Chemistry.

Sewage Pumps. Operation and Maintenance of Sewage Pumps, G. Searls. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 629–632. Reciprocating and centrifugal pumps are discussed. Before N.Y. State Sewage Works Assn.

Sewage Treatment. Interesting Extracts from Operation Reports, G. J. Schroepfer. *Sewage Works* J., vol. 16, no. 3, May 1944, pp. 632–637. Brief notes include sludge concentration and dewatering, inhibited acid for cleaning vacuum filters and cloth, at Minneapolis–St. Paul Sanitary District.

Sewage Treatment, Grease Removal. Symposium on Grease Removal. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 482–503. Symposium includes following papers: Design and Operation of Grease Interceptors, F. M. Dawson and A. A. Kalinski; Exclusion of Waste Oil from Baltimore Sewage, C. E. Keefer; Grease Removal Ordinances and Grease Problems in Sewer Maintenance, M. M. Cohn; Utilization of Sewage Grease, W. Donaldson.

Sewers, Construction. Sewer Construction Practice at Memphis. *Eng. News-Rec.*, vol. 132, no. 18, May 4, 1944, pp. 671–674. Description of procedure in building 15-mile sewer; horizontal timber shoring used; crossings under highways and railroad tracks built within timber lined tunnels excavated without shields; siphons built on concrete mats in form of dual sewers; manholes with pre-cast concrete steps and special covers designed to save critical materials.

Sludge Digestion. Controlled Digestion, H. E. Schlenz. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 504–526. Discussion of devices and procedures aiding in controlled digestion. Bibliography.

Treatment Plants, Gas Hazards. Gas Hazards Experiences in Ohio, A. E. Kimberly. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 6, June 1944, pp. 280–282. Review of accidents attributable to presence of toxic gases or oxygen deficiencies in sewerage systems and sewage treatment works. Extract from report of State Dept. of Health.

Treatment Plants, Maintenance and Repair. Equipment Maintenance in Time of War, M. M. Cohn. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 6, June 1944, pp. 295–297. Suggestions given on maintenance of aeration equipment; Infilco Activator, Yeomans-Simplex Surface Aerators, Vertical Motor Reduction Gear Drives, Chicago Swing Diffusers, Roots-Connersville Rotary Positive Displacement Blowers.

STRUCTURAL ENGINEERING

Beams and Girders, Continuous. Moment Distribution by Linked Rigidities, D. B. Steinman. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, pp. 802–808. Graphic method for analysis of continuous beams and rigid frames is developed; also equivalent numerical procedure.

Doors, Collapsible. Weathertight Doors for Wall Opening, G. F. Booss. *Eng. News-Rec.*, vol. 132, no. 18, May 4, 1944, pp. 676–677. Three second-hand, hand-operated steel shutters installed to close 50-ft opening necessary to pass overhead crane inside and outside steam electric power plant.

Elasticity. Ansatzkontrollen von Elastizitaetsgleichungen, R. Lamberg. *Bauingenieur*, vol. 23, no. 31/32, Aug. 5, 1942, pp. 233–234. Methods of checking elasticity equations; equations and calculating methods given for determining matrix sum of three-moment equations, equations for elimination of deformation, and torsion angle equations; method also developed for checking conjugated matrix.

Framed Structures, Stresses. Spannungsoptische Untersuchung eines Stockwerkrahmens, A. Spilker. *Bauingenieur*, vol. 23, no. 40/42, Oct. 5, 1942, pp. 296–300. Photoelastic examination of story frame work; example given to illustrate application of photoelasticity to study of highly static indeterminate frameworks and practical advantage of method based on comparison with results obtained by pure calculation.

Hangars, Doors. Giant Plywood Doors for Blimp Hangar. *Constructor*, vol. 26, no. 5, May 1944, p. 39. Brief illustrated description of doors at navy hangar.

Joints, Wooden. Die Berechnung von auf Biegung beanspruchten Stoessen im Holzbau, L. Faerber. *Bauingenieur*, vol. 23, no. 31/32, Aug. 5, 1942, pp. 238–240. Calculation of wooden joints under bending stresses; approximate solution for calculation of joints of solid wood cross sections developed, by which it is possible to determine rapidly and simply length of joint and requisite connections.

Structural Design. Beitrag zum Momentenausgleichverfahren, H. Wix and H. Dornau. *Bauingenieur*, vol. 23, no. 35/36, Sept. 5, 1942, pp. 267–271. Contribution to Hardy Cross moment-equalization method; application of method to calculation of frames with elastic bearings and Vierendeel trusses, described.

Tanks, Design. Stresses in Conical Bottoms of Tanks, C. A. Lee. *Eng. News-Rec.*, vol. 132, no. 18, May 4, 1944, pp. 674–675. Formulas are proposed for calculating stresses in conical bottoms of cylindrical tanks; analysis includes simple equations for direct solution of principal stresses.

TUNNELS

Expressways and Parkways, New York City. Planning Connections of West Side Elevated Highway and East River Drive With Brooklyn-Battery Tunnel, D. G. Edwards. *Mun. Engrs.—J.*, vol. 29 (Fourth Quarterly Issue), 1943, pp. 116–129, (discussion) 129–134. Various plans for routing of traffic are analyzed from points of view of tunnel needs and requirements of adjacent commercial enterprises; problem presenting greatest difficulties is that of structures in West Street.

WATER PIPE LINES

Cross Connections. Cross-Connections, F. M. Dawson and A. A. Kalinske. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 572, 622 and 623. Causes and methods of protection against cross connections and back siphonage are reviewed.

Water Supply Tunnels, New York. Operating Delaware Aqueduct by Emergency Devices, C. M. Clark. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 588 and 591. Brief outline of measures that had to be taken because of shortage of valves, gates, meters, and other equipment.

WATER RESOURCES

Water Supply, Conservation. Water Conservation and Population Shift. *Am. Water Works Assn.—J.*, vol. 36, no. 6, June 1944, pp. 698–702. Problems created by great increase of population in war production areas.

WATER TREATMENT

Chlorination. Chlorine and Its Use. *Water Works Engr.*, vol. 97, no. 11, May 31, 1944, p. 575. Discussion of chlorine properties, production and handling.

Coagulation. Water Purification Methods Involving Sodium Silicates, H. R. Hay. *Am. Water Works Assn.—J.*, vol. 36, no. 6, June 1944, pp. 626–636. Discussion of chemistry of sodium silicate coagulant aids, coagulation methods involving sodium silicates, and advantages and disadvantages of silicate treatments. Bibliography.

Filtration Plants, Jackson, Miss. Wa time Waterworks Modernization. *Eng. New Rec.*, vol. 132, no. 22, June 1, 1944, pp. 816–81 Plant at Jackson, Miss., expanded from 10 to 1 mgd capacity, converting one of two existin settling basins into rapid-mixing chamber an flocculation basin, and constructing additio to filters, settling basin, and reservoir.

Filtration Plants, Milwaukee, Wis. Mil waukee Filter Experience, J. E. Kerslake. *Wat Works Eng.*, vol. 97, no. 11, May 31, 1944, pp 554–556, 624–627. Description of plant an discussion of 5-year experience in filtration o Lake Michigan water; detailed operating dat given.

Military Engineering, Water Supply. Water Supply at Advance Bases of U.S. Navy D. H. Bennett. *New England Water Wor Assn.—J.*, vol. 58, no. 1, Mar. 1944, pp. 51–54 Problems of providing water supply, includin methods of treatment, are briefly considered Before New England Water Works Assn.

Military Engineering, Water Supply. Water Supply Equipment and Facilities for Ad vance Bases of U.S. Navy, C. T. Dickeman *New England Water Works Assn.—J.*, vol. 58 no. 1, Mar. 1944, pp. 47–50. Brief outline o problems in building advance bases. Befor New England Water Works Assn.

Softening. Developments in Split Treatmen Water Softening, D. Walker. *Am. Water Work Assn.—J.*, vol. 36, no. 6, June 1944, pp. 675–681. Cold lime softening produces completely stabilized water showing no alkalinity drop through filters, needing no recarbonation and allowing more tolerance in plant operation.

Treatment Plants, Kansas City, Mo. Two Years of Water Softening at Kansas City, Missouri, M. P. Hatcher. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 557–559. Description of adjustments found necessary in addition of softening treatment to existing purification plant.

Water Analysis. Concentrations of Certain Trace Metals in Drinking Water, R. A. Kehoe, J. Cholak, and E. J. Largent. *Am. Water Works Assn.—J.*, vol. 36, no. 6, June 1944, pp. 637–644. Results of study made of water samples collected at random from domestic, industrial, and other water supplies derived from surface and well waters; tabular data given. Bibliography.

Water Analysis, Plankton. Quality and Quantity of Plankton in South End of Lake Michigan in 1942, J. B. Lackey. *Am. Water Works Assn.—J.*, vol. 36, no. 6, June 1944, pp. 669–674. Survey made to determine increase in Plankton organisms due to pollution from domestic sewage. Bibliography.

WATER WORKS ENGINEERING

Committee Activities. Activities of Committee on Water and Sewage Works Development, E. L. Filby. *New England Water Works Assn.—J.*, vol. 58, no. 1, Mar. 1944, pp. 1–6. Presentation of six-point program to stimulate activities in cities of North America; program includes appraisal of needs for water and sewage works, improvement or construction, preparation of plans, financing, and scheduling of construction. Before New England Water Works Assn.

Great Britain. Control of Water Resources. *Water & Water Eng.*, vol. 47, no. 576, May 1944, pp. 209–213. Abstract of report of Postwar Planning Committee of British Waterworks Assn.

Great Britain. Report of Post-War Planning Committee on Post-War Water Supply. *Water & Water Eng.*, vol. 47, no. 576, May 1944, pp. 187–191. Discussion of various general problems with regard to development of postwar water supply; report of Postwar Planning Committee on Postwar Water Supply.

Greenville, S.C. Water Supply of Greenville, S.C., J. L. Hawkins. *Water Works & Sewerage*, vol. 91, no. 4, Apr. 1944, pp. 131–134. Description of treatment, distribution, quality, and financial status of system fed by all-gravity supply taken from Table Rock Reservoir with capacity of about 9.5 billion gal.

Hydrants, Maintenance and Repair. Hydrant and Valve Inspection and Maintenance, C. W. Seemann. *Am. Water Works Assn.—J.*, vol. 36, no. 5, May 1944, pp. 560–562. Description of procedure followed by Minneapolis (Minn.) Water Service Dept.

New York. Water Supply Interconnections in Western New York, N. L. Nussbaumer. *Water Works & Sewerage*, vol. 91, no. 4, Apr. 1944, pp. 123–126. Plan of reinforcements for system along Niagara River including western New York State water system, city of Buffalo, and cities of Tonawanda and North Tonawanda; legal and financial problems are briefly discussed.

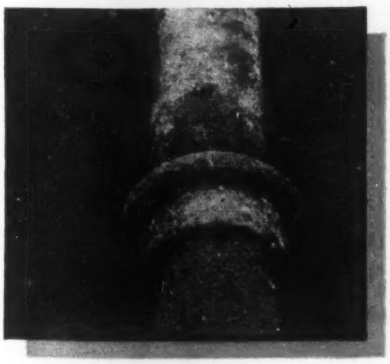
Public Utilities, Canada. Utility Administration in Canada, A. E. Berry. *Water & Sewage*, vol. 82, no. 5, May 1944, pp. 56 and 58. Brief survey of administration in British Columbia, Alberta, Saskatchewan, Manitoba, Quebec, and New Brunswick. Before Am. Water Works Assn.

Water Tanks and Towers. 1,700,000 Gallons of Elevated Storage in Water System at Stockton. *Water Tower*, vol. 30, no. 5, May 1944, pp. 6–7. Brief illustrated description of elevated tanks in Stockton, Calif., consisting of three tanks of 500,000-gal capacity and one tank of 200,000-gal capacity.

her first municipal gas lamps were lighted–

Philadelphia laid a cast iron water main which is STILL IN SERVICE

Detroit, Michigan: Unretouched photograph of section of a 105-year-old cast iron water main.



Charleston, S. C.: Unretouched photograph of section of a 106-year-old cast iron gas main.

OIL LAMPS still lighted the sidewalks of New York and Philadelphia when America's oldest cast iron water main went into service in the year 1822. (Philadelphia was not lighted with gas until 1836.) Such bits of history help one to realize what radically changed conditions cast iron mains have lived through in more than a century of service.

The three cast iron mains shown in this advertisement, photographed while temporarily uncovered for inspection, are from 105 to 122 years old. These good and faithful public servants have paid for themselves many times over—have survived revolutionary changes in traffic conditions, building construction and public services—yet they are still rendering satisfactory service.

History is on the side of cast iron pipe—a history of long life, low maintenance, low cost per service year. But the brightest pages of its history lie ahead. For today's cast iron pipe is far different from the pipe of 100 years ago. It is made to scientific design, based on continuing field and foundry research, and with highly-developed production and laboratory controls at every step.

CAST IRON

CAST IRON PIPE RESEARCH ASSOCIATION

Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3

Serves for Centuries

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Floors. Use of Pre-cast Pre-stressed Concrete Beams in Bridge Deck Construction, A. A. Paul. *Instn. Civ. Engrs.—J.*, no. 1, Nov. 1943, pp. 19–30. Beams used in re-decking bridges described were designed and constructed essentially for emergency bridge work, no special attention being paid to additional requirements necessary for permanent structure.

Highway. Highway Bridges. *Surveyor*, vol. 103, no. 2711, Jan. 7, 1944, pp. 5–6. Review of discussions reported during past year on bridge designs; foundations, span types, bombed structures, and road tunnels discussed.

Highway, Reconstruction. Re-Deck Bridge Under Traffic, M. A. Clark. *Western Construction News*, vol. 19, no. 5, May 1944, pp. 82–83. Mat of railroad rails, with intervals filled with concrete and surfaced with asphaltic plant mix, placed on highway bridge over Colorado River at Yuma, Ariz., while maintaining heavy flow of traffic using structure; road width is only 18 ft, making half-width work impossible.

Railroad Structures, Iron and Steel. Adapting Salvaged Steel Presents Special Problems, R. N. Brodie. *Ry. Eng. & Maintenance*, vol. 40, no. 7, July 1944, pp. 618–619. Explanation of recommended procedure in refabricating salvaged steel for bridges and other structures.

Raising. Railroad Lift Bridge Raised Eighteen Feet. *Eng. News-Rec.*, vol. 132, no. 14, Apr. 6, 1944, pp. 486–489. Steel truss, vertical-lift railroad bridge across Tennessee River is being raised 18 ft to be above pool level of Kentucky Dam reservoir; spans are lifted in about 3-ft increments by two hydraulic jacks under each end floorbeam; as jacking progresses, reinforced concrete piers are increased in height.

Steel, Painting. Protective Paints for Steelwork in Tropical Climates, H. E. Whitehouse. *Instn. Civ. Engrs.—J.*, no. 4, Feb. 1944, pp. 199–214. Paper deals primarily with experiences gained during studies made to discover suitable paint for Lower Zambesi bridge in Portuguese East Africa; conditions at site; protective coatings for steelwork; large-scale painting operations.

Steel, Strengthening. Stronger Viaducts for War Traffic. *Ry. Age*, vol. 116, no. 25, June 17, 1944, pp. 1167–1169. To permit important section of main line to be opened to heaviest locomotives, Nickel Plate has completed extensive bridge improvement program involving reinforcing of girder spans in three steel viaducts having combined length of nearly 3,000 ft and strengthening of towers in two others totaling more than 2,000 ft in length; manner in which work was carried out.

Suspension, Maintenance and Repair. Bay Bridge Suspender Rope Replaced, E. F. Levy. *Western Construction News*, vol. 19, no. 5, May 1944, pp. 75–76. Proper stressing and attachment of suspender rope replacement achieved by means of jacking rig; suspender rope clamped to $^3/_4$-in. load line and hoisted over main cable in installation.

Suspension, Wind Stresses. Installation for Recording Movements of Golden Gate Bridge. *Engineer*, vol. 177, no. 4604, April 7, 1944, pp. 275–276. Illustrated description of instrument for measuring wind directions and velocities, installed on suspension bridge in San Francisco.

Wooden, Prefabricated. Prefabricated Bridges Treated in Oregon and Erected in Alaska. *Construction Methods*, vol. 26, no. 6, June 1944, p. 67. Illustrations and brief notes on 160-ft through-truss spans which were fabricated by Wauna Lumber Company, Oregon, to replace temporary crossings on route of Alaska Highway.

BUILDINGS

Demolition. Elements of Demolition Contract, C. W. Craske. *Surveyor*, vol. 103, nos. 2713, and 2714, Jan. 21, 1944, pp. 27–29, Jan. 28, p. 41. Outline of items that should be included in contract and lines that demolition specification should follow.

Wind Stresses. Wind Loads on Buildings, H. Ferrington. *Structural Engr.*, vol. 21, no. 12, Dec. 1943, pp. 497–526. Report on authors' investigations to determine factors upon which to base wind loads in designing modern framed buildings; author collected data on velocities of wind experienced in British Isles, but found that in order to understand their significance it would be necessary to obtain knowledge of elementary meteorology and to study conditions under which maximum winds occur in British Isles, how they are measured and for what purpose.

Wind Stresses. Wind Pressure on Buildings Including Effects of Adjacent Buildings, A. Bailey, and N. D. G. Vincent. *Instn. Civ. Engrs.—J.*, no. 8, Oct. 1943, pp. 243–275, (discussion) no. 6, Apr. 1944, pp. 121–125. In endeavor to determine any general relations which may exist between wind speed and distribution of wind pressure over buildings of various forms, both under fully exposed conditions and when in close proximity to other buildings, tests have been carried out on number of model buildings in wind-tunnel; description of these tests, together with discussion of results obtained, is given.

CITY AND REGIONAL PLANNING

Calcutta. Calcutta Improvement Work, W. H. Prosser. *Surveyor*, vol. 103, no. 2715, Feb. 4, 1944, pp. 55–56. Work which Calcutta Improvement Trust has undertaken for improvement of that city described; main features of improvement plan are road alinements, road construction, roadmaking specifications, and rehousing problem discussed. Before Instn. Sanitary Engrs.

Drainage, Great Britain. Notes on Preservation of Watercourses in Town Planning, W. H. Elgar. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 9, Mar. 7, 1944, pp. 338–341. Dangers of indiscriminate filling up of artificial ditches and culverting of natural streams are only apparent when gardens or other open spaces become flooded or waterlogged; treatment of such watercourses in town planning.

Effect on Home Life. Planning of Town as Affecting Home. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 9, Mar. 7, 1944, pp. 317–321. Conference held in connection with Practical Planning Exhibition organized by Instn. Civil Engineers covering women's points of view on housing problems; majority of women contacted preferred houses to flats and had distinct preference for residential sections provided with schools, churches, playgrounds, and food stores, making trips into commercial sections necessary only occasionally.

Great Britain. Replanning Central Area of City of Wakefield, S. G. Wardley. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 7, Jan. 4, 1944, pp. 248–257, (discussion) 257–262; see also abstract in *Surveyor*, vol. 102, no. 2704, Nov. 19, 1943, p. 483. Brief survey of history of town planning leading to development of such projects as one presented; plan for Wakefield intended to anticipate and guide new construction for several years and to provide for repair of war damage.

Housing, Great Britain. Post-War Housing. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 9, Mar. 7, 1944, pp. 322–325. Informal discussion held at Guildhall, Nottingham, where following points were taken up: Economy in use of materials; possibilities of prefabricated houses; design of small dwellings.

CONCRETE

Barges. Quantity Production of Concrete Barges. *Engineering*, vol. 157, no. 4084, Apr. 21, 1944, p. 315. Supplementing article previously indexed from Nov. 19, 1943, issue of same journal, further particulars have been disclosed, including dimensions; barges are 81 ft long, and have width of 22 ft 6 in. at deck; bare hull weight is 128 tons; barges are built as far as possible of pre-cast sections, numbering 174, which are made in various localities remote from assembly yard.

Beams and Girders. Plastic Theories for Ultimate Strength of Reinforced-Concrete Beams, R. H. Evans. *Instn. Civ. Engrs.—J.*, no. 2, Dec. 1943, pp. 98–121, 1 supp. plate. Author ha made tests on 41 beams and columns with objec of examining stress-strain relation in differen concrete mixes up to fracture; observing strain distribution in under- and over-reinforced concrete beams; measuring strains in tension reinforcement of 1-in. and 8-in. gage-lengths; an comparing accuracy of suggested new theories Bibliography.

Creep. Creep and Shrinkage in Plain, Reinforced, and Pre-Stressed Concrete. General Method of Calculation, A. D. Ross. *Instn. Civ Engrs.—J.*, no. 1, Nov, 1943, pp. 38–57. Idealized model suggested to represent concrete provides simple and extremely flexible approach to any problem in reinforced concrete in which inelastic deformations must be considered, and i offered tentatively, until justified by experimental evidence, in hope that it will find further applications and developments.

Hangars. Flight Hangar of Reinforced Concrete Saves Critical Materials. *Construction Methods*, vol. 26, no. 6, June 1944, p. 56. Brief illustrated description of hangar with floor area of 180,000 sq ft, built under direction of U.S. Engineer Dept. at Curtiss-Wright Plant, Buffalo, N.Y.

Light Weight. Washington Haydite Co. Uses Local Material for Light-Weight Aggregate, W. E. Trauffer. *Pit & Quarry*, vol. 36, no. 12, June 1944, pp. 71–72. Notes on activities of producer near Bothell, Wash., 16 miles northeast of Seattle; typical analysis of clay; about 1/ cu yd of Haydite is obtained from each cubic yard of clay mines; mix for concrete blocks contains about 55% of fines and $^3/_{16}$-in. material and 45% of $^1/_2$-in. material; these products weigh about 60 lb per cu ft.

Pipe, Prestressed. Prestressed Concrete Pipe Made by New Method Saves Steel. *Construction Methods*, vol. 26, no. 6, June 1944, pp. 66, 118, and 120. Principle of prestressing steel in tension and concrete in compression applied to construction of pipe; pipe follows general Lock Joint design in having continuous welded steel cylinder with steel ring joints forming bell and spigot ends and rubber gasket as sealing element; cylinder is centrifugally lined with concrete to thickness of $1^7/_8$ in.

Properties. Concretes Containing Air-Entraining Agents—Symposium. *Am. Concrete Inst.—J.*, vol. 15, no. 6, June 1944, pp. 509–569. Symposium of following papers: Introduction and Questions to Which Answers Are Sought, F. H. Jackson; Function of Entrained Air in Portland Cement, H. L. Kennedy; Laboratory Freezing and Thawing Tests on Concretes Containing Various Air-Entraining Agents, H. S. Meissner; Air Entrainment Calls for Changes in Mix Design and Mixing Practice, M. A. Swayze; Methods of Entraining Air in Concrete, D. R. Macpherson; Manufacture and Use of Air-Entraining Portland Cement, G. L. Lindsay; Aeration, Offering Improved Concreting, Should Be Used with Caution, H. F. Thomson; Milwaukee's Experiences with Air-Entraining Cements, R. A. Burmeister; Air-Entraining Cements in Ready-Mixed Concrete Industry, S. Walker; Entrained Air Beneficial in Freezing and Thawing Tests, R. E. Davis; Field Experiences with Concrete Containing Air-Entraining Cement, G. H. Larson; Laboratory and Field Experiences, J. H. Chubb; Effect of Air-Entraining Agents on Pumped Concrete, R. T. Sherrod; Air-Entraining Agents in Ohio Highways, J. F. Barbee; Air-Entraining Agents Not Cure-All, F. V. Reagel; and Concluding Summary, F. H. Jackson.

Railroad Ties. Concrete Pot Sleepers on G.W.R., E. C. Cookson. *Ry. Gaz.*, vol. 80, no. 21, May 26, 1944, pp. 545–546. Details pertaining to manufacture of concrete block ties, together with indication as to type and design of reinforced concrete transverse ties in use on Great Western Railway. Before Permanent Way Inst.

Ready Mixed, Ohio. Speeding Up Concrete for Airports, J. A. Twyman. *Rock Products*, vol. 47, no. 6, June 1944, pp. 78 and 82. Cen-

You can do it Better
...with MONOTUBES!

And here's why: Their tapered, fluted construction makes possible *speed with safety;* their tubular design means that you can *inspect them quickly,* top to toe, after they're driven to required bearing; extensions permit the fast, economical *installation of varying pile lengths* even in low headroom; and their light weight, despite their remarkable strength, allows you to *drive them with average job equipment.* Gauges, sizes, and tapers to meet all requirements. Write for your copy of Catalog 68A to the Union Metal Manufacturing Co., Canton 5, Ohio.

UNION METAL
Monotube Tapered Piles

FAMOUS FIRSTS

The above picture of Irving Subway Grating, published in a N. Y. City newspaper early in the 20th Century, was entitled "An Isle of Safety."
35th St. and Broadway, N. Y. City

In the evolution of its business since 1902, **Irving Subway Grating Company** has scored these outstanding firsts — all **Isles of Safety** in their respective fields:

1908—First open steel mesh Gratings for New York City Subways.

1912—First open steel mesh Flooring for Industrial Plants (Solvay Process Co., Syracuse, N. Y.)

1916—First open steel mesh Armouring for Heavy Duty Concrete Floors (our own Forge Shop).

1917—First open steel mesh Gratings for Ships (Navy Mine Sweepers Pusey & Jones, Wilmington, Del.)

1927—First to equip Freight Car Tops with open steel mesh Runways (Henry Ford's D. T. & I. R.R.)

1927—First Continuous Grating—one-piece for any length and width (Bryant & Chapman, Hartford, Conn.)

1929—First Steel Mesh Landing Mats offered the Navy Bureau of Aeronautics.

1932—First open steel mesh Decking for Bridges (University Bridge, Seattle, Wash.)

1940—First Portable Emergency Landing Mats accepted by U. S. Army Engineer Corps (Virgin Islands).

1943—First open steel mesh Roadway Armoring for Postwar Highways (test installation at Darien, Conn.)

IRVING SUBWAY GRATING CO., INC.

Main Office and Plant: 50-08 27th St., Long Island City 1, New York
Western Office and Plant: Foot of Park Ave., Emeryville 8, Calif.

tral States Construction Company of Osborn, Ohio, supplies ready-mixed concrete for big army air fields.

ROAD MATERIALS. Tests of Concretes Containing Air-Entraining Portland Cements or Air-Entraining Materials Added to Batch at Mixer, H. F. Gonnerman. *Am. Concrete Inst.—J.*, vol. 15, no. 6, June 1944, pp. 477–507. Results obtained in extensive laboratory studies made in connection with construction of 18 experimental road projects, and in several separate laboratory investigations conducted during past 6 years. Bibliography.

TANKS. Wire-Wound Concrete Tanks. *Engineering*, vol. 157, no. 4089, May 26, 1944, p. 406. Illustrated description of large cylindrical tanks of concrete for holding water or other liquids; constructed by Preload Company, New York.

CONSTRUCTION ENGINEERING

CONSTRUCTION EQUIPMENT. Machinery and Plant in Connexion with Civil Engineering Construction, G. M. Burt. *Instn. Civ. Engrs.—J.*, no. 7, May 1944, pp. 128–152, 3 supp. plates; see also *Mech. Handling*, vol. 31, no. 4, Apr. 1944, pp. 175–177. Development of machines, including earth-moving machinery, tractors, cranes, mixers, and vibrators; dock and harbor equipment; tunneling plants.

DAMS

BONNEVILLE, NORTHWEST PLAN. Bonneville Suggests Northwest Plan. *Western Construction News*, vol. 19, no. 5, May 1944, pp. 80–81. Brief outline of plan drawn up by Bonneville Power Administration for physical and industrial development of Columbia Basin; plan includes 30 dams and full exploitation of mineral, lumber, and agriculture resources as well as expansion of industrial facilities.

CONSTRUCTION, EQUIPMENT. Compressed Air Tools Speed Construction at Keswick Dam, R. K. Fowler. *Western Construction News*, vol. 19, no. 5, May 1944, p. 86. Buffer designed to clean threads on shed bolts and tie rods, and router designed to remove firtex joint filling material between walls and columns, are both operated by compressed air.

RESERVOIRS, GREAT BRITAIN. Remedial Works in Connexion with Waldershelf Slip—Broomhead Reservoir, L. Bendelow. *Instn. Civ. Engrs.—J.*, no. 6, Apr. 1944, pp. 95–106, 2 supp. plates. Remedial works successfully carried out in connection with landslip, now known as Waldershelf slip, situated close to northern end of embankment and adjacent to overflow works of Broomhead reservoir.

RESERVOIRS, GROUTING. Pressure Grouting: Some Notes on Standard Practice, E. W. Denholm. *Water & Water Eng.*, vol. 47, no. 577, June 1944, pp. 257–262. Various methods of cementation are described, and application to grouting of reservoir cut-off walls and control of leakage from existing reservoirs are discussed.

FOUNDATIONS

RETAINING WALLS, EARTH PRESSURE. Earth Pressures and Sheet Piling, D. Lee. *Concrete & Constr. Eng.*, vol. 39, nos. 2, 3, 4, and 5, Feb. 1944, pp. 35–42; Mar., pp. 65–69; Apr., pp. 89–97; May, pp. 123–128, 1 supp. sheet. Outline of hydrostatic pressure-distribution methods used to demonstrate form of active and passive earth pressures supporting sheet-piling walls; author attempts to show that assumptions, although apparently fairly serious in error, are in fact safe for design and facilitate calculations.

HYDRAULIC ENGINEERING

CAVITATION. On Destructive Action of Cavitation, M. Kornfeld and L. Suvorov. *J. Applied Physics*, vol. 15, no. 6, June 1944, pp. 495–496. Review of previous studies and account of experiments to determine destructive action of cavitation.

REINFORCEMENT. High-Yield-Stress Steel as Column and Beam Reinforcement, C. E. Reynolds. *Instn. Civ. Engrs.—J.*, no. 4, Feb. 1944, pp. 227–250. Two-fold object of paper is to examine properties of high-yield-stress steels and to consider their application to design; consideration of available steels involves study of work of many investigators, together with tests undertaken for this specific purpose; these latter tests relate primarily to twisted square bars, for which few experimental data exist in comparison with more comprehensive literature on mild steel and twin-twisted bars.

HYDROLOGY AND METEOROLOGY

EARTHQUAKES, NEW ZEALAND. Earthquake Risk in New Zealand, J. Henderson. *New Zealand J. of Science & Technology*, vol. 24, no. 5B, Mar. 1943, pp. 195B-219B. References are given to accounts of earthquakes felt in New Zealand since European occupation; topographical and geological evidences of earthquakes are briefly sketched as are relevant points of geological structure; risk of earthquakes in different parts of New Zealand is discussed; wave motions of earthquakes and their effects on different kinds of ground; how damage by earthquakes may be guarded against and reduced. Bibliography.

RAIN AND RAINFALL, LOUISVILLE, KY. Rainfall Distribution at Louisville, C. F. Johnson. *Eng. News-Rec.*, vol. 132, no. 14, Apr. 6, 1944, pp. 490–491. Records obtained with group of recording gages revealed that annual precipitation in given year may vary from 84.4 to 121.9% of "official" figures over limited area.

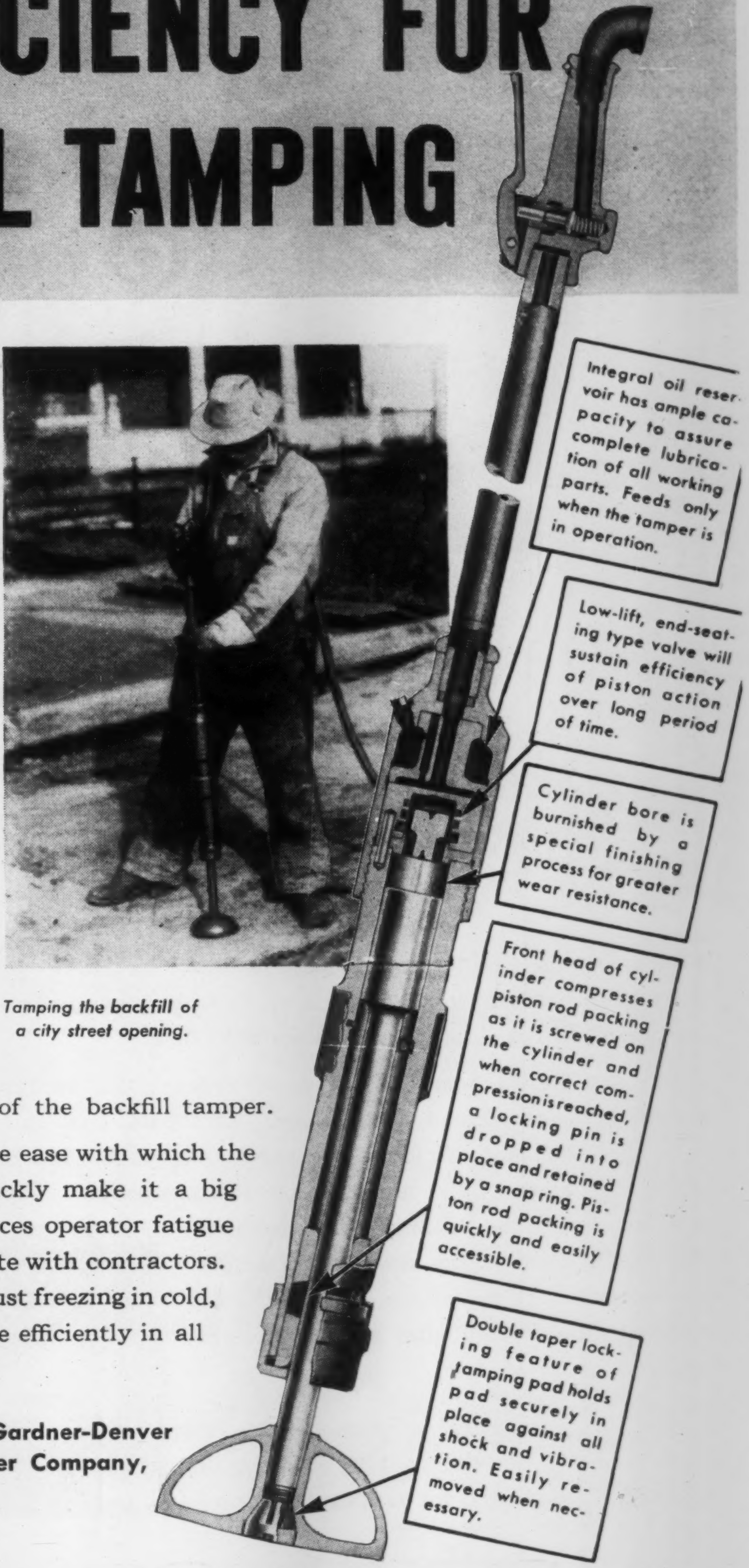
MORE EFFICIENCY FOR MECHANICAL TAMPING

With the NEW Gardner-Denver Backfill Tamper

Meet the new backfill tamper that brings new efficiency . . . new operator comfort and convenience to mechanical tamping.

The Gardner-Denver T-23 Backfill Tamper is a rugged, exceptionally well-designed construction tool that will compact backfill to meet the most exacting requirements . . . and do it *fast*. It is a product of skilled Gardner-Denver engineers . . . men who have gained their experience in the field and have incorporated that experience in the design of the backfill tamper.

The smooth-holding characteristics and the ease with which the T-23 can be "walked" over the fill will quickly make it a big favorite with operators. And because it reduces operator fatigue and speeds operations, it will be a big favorite with contractors. There's no need to worry about valve or exhaust freezing in cold, damp weather. The T-23 is built to operate efficiently in all kinds of weather.



Tamping the backfill of a city street opening.

Integral oil reservoir has ample capacity to assure complete lubrication of all working parts. Feeds only when the tamper is in operation.

Low-lift, end-seating type valve will sustain efficiency of piston action over long period of time.

Cylinder bore is burnished by a special finishing process for greater wear resistance.

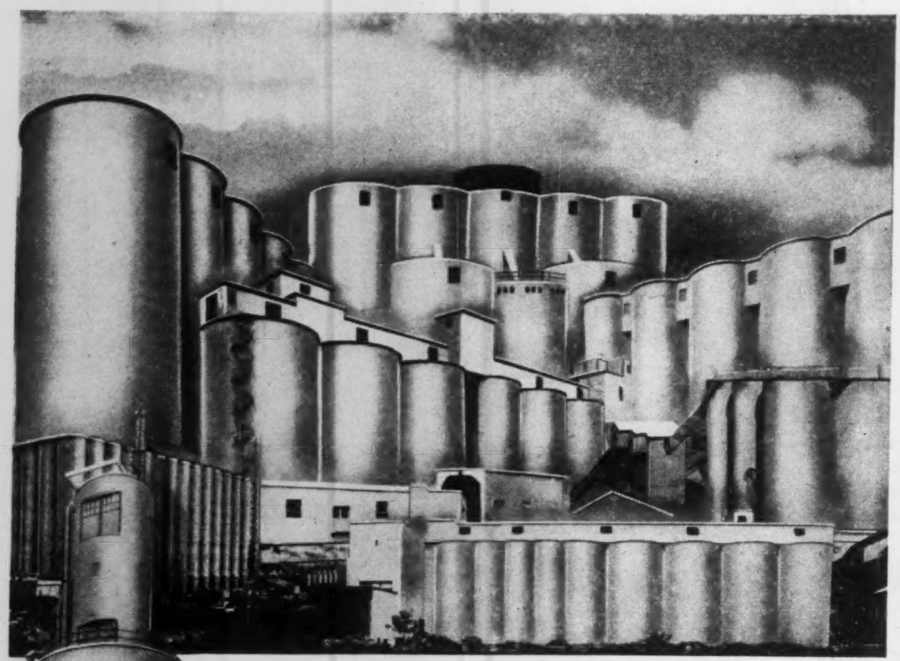
Front head of cylinder compresses piston rod packing as it is screwed on the cylinder and when correct compression is reached, a locking pin is dropped into place and retained by a snap ring. Piston rod packing is quickly and easily accessible.

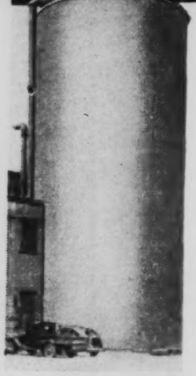
Double taper locking feature of tamping pad holds pad securely in place against all shock and vibration. Easily removed when necessary.

For complete information on the new Gardner-Denver Backfill Tamper, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER
Since 1859

USE COMPRESSED AIR FOR *Safety Convenience Flexibility*



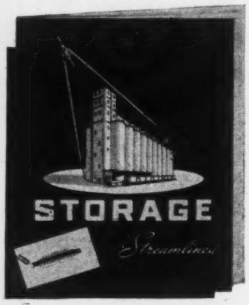


Versatility and Experience as applied to Bin Design and Construction

Wherever you find concrete storage bins—or tanks—you are likely to find Nicholson jobs because we have been serving industry since 1914 along these specialized lines.

Above are shown some of our most recent jobs, representing storage bins for cement, grain, silica, pigments, coal and coke. As a matter of fact, we have designed and constructed bins for practically every bulk material used in industry. We make extensive use of the "sliding form" methods and, for tanks, the "pre-stressed" concrete construction. The former cuts building costs and time; and latter makes stronger tanks.

If you are planning a storage bin or tank, you will get the best by coming to NICHOLSON. (Send for our latest catalog.)



BULK STORAGE
COAL-GRAIN-LIQUIDS
STORAGE
HANDLING EQUIPMENT
THE NICHOLSON CO.
CONSTRUCTION
CEMENT-OIL-CHEMICALS

9-NC-1

Ten Rockefeller Plaza, New York 20, N. Y.

MATERIALS TESTING

Columns, Concrete. Experiments on Reinforced Concrete Column Bases, W. T. Marshall. *Instn. Civ. Engrs.—J.*, vol. 22, no. 5, Mar. 1944, pp. 49–52. Report on experiments carried out by author at Imperial College of Science and Technology on square isolated column bases; method of design of such bases; results of tests carried out on bases 8 in. square and $1\frac{1}{8}$ and $1\frac{5}{8}$ in. thick; paper describes also tests on 1:2:4 concrete bases, 2 ft square and 4 in. thick, using stanchion 4 in. square.

Concrete. Effect of Aggregate Segregation on Concrete Strength, A. C. Avril. *Rock Products*, vol. 47, no. 6, June 1944, pp. 64–65. Tests of concrete made from samples of sand and gravel taken at different points in stockpiles indicate extent to which segregation affects quality of concrete.

Concrete. Entrained Air—Its Effect on Constituents of Portland Cement Concrete, H. L. Kennedy. *Am. Soc. Testing Matls.—Preprint No. 57* for meeting June 26–30, 1944, 10 pp. Investigations covering effect of two types of air-entraining agents on various constituents of portland cement concrete; amount of air entrained by fine aggregate constituent and two methods of measuring air described; photomicrographs are shown for both cement and fine aggregate in presence of air-entraining agents; concrete, with and without air-entraining agents, described and illustrated.

Concrete. Freezing and Thawing Tests of Concrete Made With Different Aggregates, S. Walker. *Am. Concrete Inst.—J.*, vol. 15, no. 6, June 1944, pp. 573–577. Summary of information on freezing-and-thawing tests of concrete made with different coarse aggregates and description of "durability factor" which may be calculated as function of cycles of freezing and thawing and their effect on modulus of elasticity of concrete as measured dynamically.

Concrete Construction, Bombing Effect. Bombenwirkungen gegen Stahlbeton und Ermittlung von Schutzdicken, O. Speth. *Bauingenieur*, vol. 23, no. 47/48, Nov. 20, 1942, pp. 339–353. Study of bombing effects on reinforced concrete to determine required thickness of concrete to withstand air attack; results of large-scale tests carried out to determine resistance of reinforced concrete; illustrated description.

MUNICIPAL ENGINEERING

Great Britain. Development of Regional Water Supplies and Main Drainage. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 6, Dec. 7, 1943, pp. 201–209; see also abstract in *Surveyor*, vol. 102, no. 2700, Oct. 22, 1943, pp. 435–436. In connection with practical planning exhibition organized by Instn. Civil Engrs. and Instn. Municipal and County Engrs., conference was held on important fundamentals for proper water supply and sewage planning for any town and country area.

Johannesburg, South Africa. Municipal Progress in Johannesburg, E. J. Hamlin. *S. African Engr. & Elec. Rev.*, vol. 35, no. 313, May 1944, pp. 27, 29, and 31. Progress and difficulties that have had to be overcome, are dealt with; native employees; paving of footpaths; street railroads; sewage disposal; water supply; public cleaning; town planning; building work.

PORTS AND MARITIME STRUCTURES

Jetties. Construction of Jetties in Exposed Roadsteads; with Particular Reference to Reinforced Concrete Structure Provided at Tolaga Bay, New Zealand. *Instn. Civ. Engrs.—J.*, no. 4, Feb. 1944, pp. 214–227, 1 supp. sheet. Location and determination of design for jetty; shipping arrangements; construction; tidal wave effects.

Piers, Construction. Quick Method of Constructing Concrete Wharves and Piers Below Tides. H. B. Temple-Richards. *Instn. Civ. Engrs.—J.*, no. 1, Nov. 1943, pp. 35–36, 1 supp. plate. Devices are suggested as quick method for constructing piers when design is either all concrete, concrete with rubble hearting, or concrete block walls with concrete and rubble hearting, founded on prepared hard or rock bottom; proposals curtail and simplify diving work required, reduce quantity of falsework which is subject to wave action with consequent damage and delay, and give far higher speed of construction.

Reconstruction. Naples: Case History in Invasion, J. S. Gorlinski. *Military Engr.*, vol. 36, no. 222, Apr. 1944, pp. 109–114. Problems met in clearing Naples Harbor and repairing necessary structures.

ROADS AND STREETS

Airport Runways, Testing. Method of Testing Bearing Capacity of Soils and Runways as Used by Central Public Works Department, India, J. J. Bryan. *Instn. Civ. Engrs.—J.*, no. 2, Dec. 1943, pp. 121–122, 1 plate. Owing to lack of precise knowledge concerning distribution of load through runway, and also to lack of knowledge concerning variation in bearing capacity of soils with variation in shape and area loaded, it was decided to introduce tests which, as nearly as possible, reproduce conditions actually encountered in practice; worst loads are imposed by aircraft when at rest; crash landings excepted.

Alberta. Alberta Connections with Alaska Highway, G. H. N. Monkman. *Miner*, vol. 17, no. 4, Apr. 1944, p. 60. Brief summary of projected work.

DIXON'S TYPHONITE ELDORADO— HB

It's Yours

TO TRY—AND COMPARE!

Draftsmen all, including Chiefs, read on.

We ask you to satisfy yourself (and us) whether you are getting from the drawing pencils you use
the smooth responsiveness,
the opacity of line,
the uniformity and accuracy
of grading,
the strength of lead
that put Dixon's Typhonite Eldorado Pencils at the head of drawing pencils for draftsmen. That is a simple proposition.

Send to us for comparison sample by filling in and mailing the coupon below.

TYPHONITE

ELDORADO

Pencil Sales Dept. 38-J9, Joseph Dixon Crucible Co., Jersey City 3, N. J.

Gentlemen:

Please send me a free "Comparison Sample" of Typhonite Eldorado drawing pencil in .... degree.

Name..

Address..

City.......................................State........................

a Breather

FOR HOT PLANES AND MEN

Heat — 140 degrees, and more —
maintenance crews in plane interiors, oven hot.
Portable ventilating units, powered by gasoline engines,
bring relief — draw hot air out, or shoot cool air in —
one more war job for dependable Briggs & Stratton
4-cycle air-cooled gasoline engines.

Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

During 25 years of *continuous* production Briggs & Stratton has built more than 2,000,000 air-cooled 4-cycle gasoline engines. We are now well started on the 3rd million. Their trouble-free performance, easy starting and economy have made Briggs & Stratton leaders in the field—"preferred power" everywhere.
BRIGGS & STRATTON CORPORATION, Milwaukee 1, Wisconsin, U. S. A.

British Columbia. British Columbia Highways, Present and Future, H. Anscomb. *Miner*, vol. 17, no. 4, Apr. 1944, pp. 58–59. Brief descriptive review, with statistical data; during 10 years policy of Department of Public Works has been to improve existing highways; particular attention has been paid to provide access roads to mining properties; esimated costs of nine major projects.

Great Britain. Improved Methods of Road Lay-Out and Construction and Use of Motorways with Special Reference to Safety. *Instn. Mun. & County Engrs.—J.*, vol. 70, no. 7, Jan. 4, 1944, pp. 237–247; see also Abstract in *Surveyor*, vol. 102, no. 2701, Oct. 29, 1943, pp. 447–449. Conference held in connection with Practical Planning Exhibition of Instn. Civil Engrs., covering improvements in road system that would tend to further proposals for post-war social and industrial development.

Highway Accident Prevention. Some Aspects of Road Safety Problem, F. A. J. Smith. *Surveyor*, vol. 103, no. 2716, Feb. 11, 1944, pp. 67–68. Consideration of measures to be adopted in planning and layout of new highways; adaptation of existing highways to meet present-day conditions; principles that should be followed in layout of new towns concerning central road islands, road signs, junctions, parking facilities, street lighting, cycle tracks, and guard rails.

Highway Systems. Recommended Interregional Highway. *Pub. Works*, vol. 75, no. 2, Feb. 1944, pp. 13–14 and 47. Extracts from report of National Interregional Highway Committee, which explains bases upon which selection of several unit highways of system was made, and supplements this with discussions of Mid-City Terminals of Express Highways, limiting access to Interregional Routes; acquisition of rights of way; principles of landscape design, standards and features of roadway location and design, and construction of system; brief discussion of location of routes that make up system.

Highway Systems, Florida. Overseas Highway Along Florida Keys Revamped to Serve War Traffic. *Construction Methods*, vol. 26, no. 6, June 1944, pp. 58–59, 120, 122, and 124. Description of operations in construction of 123-mile highway from Florida City to Key West.

Highway Systems, Peru. Ocean-to-Amazon Highway, J. L. Schley. *Military Engr.*, vol. 36, no. 222, Apr. 1944, pp. 128–132. Description of highway from Lima to Pucalpa.

Maintenance and Repair. Calcium Chloride Stabilized Roads Carry Heavy Traffic at Polymer, R. L. Hearn. *Eng. & Contract Rec.*, vol. 57, no. 24, June 14, 1944, pp. 16–17. Stabilized clay roads carry 17-ton mixers during construction operations; road specifications.

Maintenance and Repair. How to Obtain Best Results in Concrete Pavement Patching, *Eng. & Contract Rec.*, vol. 57, no. 2, Jan. 12, 1944, pp. 18–20 and 25. Detailed description of proper design of patches in concrete pavements.

Military Engineering. Desert Roads, J. B. Cress and J. H. Sawyer, Jr. *Military Engr.*, vol. 37, no. 223, May 1944, pp. 162–163. Description of types of soils encountered by Army Engineers in construction of desert roads, and methods of treatment.

Road Materials, Bituminous. Bitumen-Aggregate Adhesion, J. M. Swanson. *Indus. & Eng. Chem.*, vol. 36, no. 6, June 1944, pp. 584–588. Methods of increasing water-displacement properties and adhesion of bituminous materials toward commercial road aggregates discussed; specific modifications of general method suggested by McLeod developed as promising for practical road construction; this type of treatment has been applied to plant mixes, and process tested on small scale in field; details of procedures; successes and failures of road panels considered. Bibliography.

Road Materials, Steel Mats. Steel Grating Is Tested as Highway Surface. *Construction Methods*, vol. 26, no. 6, June 1944, p. 82. Illustrations and brief note on test in Darien, Conn., using section of roadway 48 ft long; grating laid in 2 by $12^{1}/_{2}$-ft panels filled with sand and surfaced with road oil.

SANITARY ENGINEERING

Latin America. Water Supply and Sewerage Problems in Latin American Countries, A. E. Williamson. *Eng. News-Rec.*, vol. 132, no. 14, Apr. 6, 1944, pp. 474–478. Status of water supply and sewerage reviewed, on basis of data assembled by Office of Coordinator of Inter-American Affairs.

SEWERAGE AND SEWAGE DISPOSAL

Activated Sludge. Gary Sanitary District (1942), W. W. Mathews. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 637–639. Abstract of report for 1942 describing operation of plant handling about 100,000 population, with flow of 19.37 mgd.

Canada. Sewerage Developments and Prospects in Canada, A. E. Berry. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 602–612. Review of past and current practices and future prospects.

Elizabeth, N. J. Sludge Concentration and Barging at Elizabeth (N.J.) Joint Meeting Sewage Treatment Works, W. Rudolfs. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 617–622. Purpose of sludge concentration at Joint Meeting Treatment Plant is reduction in volume of sludge and reduction in cost of barging; methods and procedures discussed.

TODAY A JUNGLE TOMORROW A RUNWAY

WILL THEY EVER mount a Diesel Tractor alongside the cannon on a courthouse lawn to honor this great combat weapon? Anyway, it's an idea! For here's a peace-time builder that's a sensation on the battlefield, winning praises from GIs and Generals alike—moving dirt, rock, sand, frozen tundra and jungle swamp—by the ton and in a hurry.

Tens of thousands of International Tractors are serving the military—in the Army, the Navy, the Marine Corps and the Air Forces. Tractors pave the way for airpower, footpower and firepower . . . *All honor to the men who drive them!*

While these tractors are fighting on the battlefront, it's up to all tractor operators to conserve equipment here on the home front. *Make it last!* Harvester and the International Power Distributors stand ready to see you through.

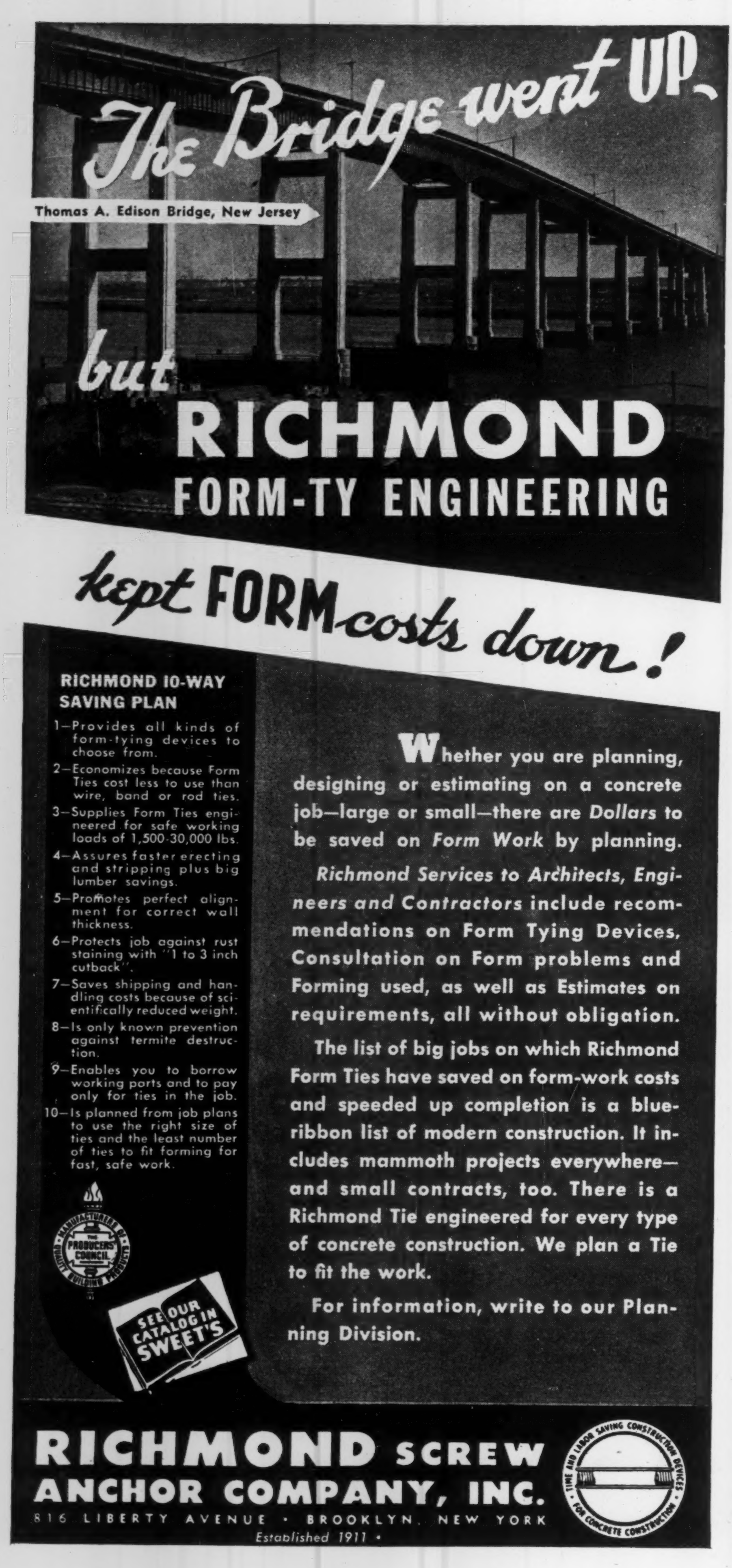
If your need for new equipment is vital to the war effort, we will have equipment for you. If your need is less vital we will safeguard your present International Power with every service at our command.

And in the meantime, let's all remember that it's up to all of us to fight harder on the home front . . . fight on the food front—give to the blood bank—buy extra War Bonds—fight inflation. FOR VICTORY.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL HARVESTER

Power for Victory . . . Power for Peace



RICHMOND
FORM-TY ENGINEERING

kept FORM costs down!

RICHMOND 10-WAY SAVING PLAN

1—Provides all kinds of form-tying devices to choose from.
2—Economizes because Form Ties cost less to use than wire, band or rod ties.
3—Supplies Form Ties engineered for safe working loads of 1,500-30,000 lbs.
4—Assures faster erecting and stripping plus big lumber savings.
5—Promotes perfect alignment for correct wall thickness.
6—Protects job against rust staining with "1 to 3 inch cutback".
7—Saves shipping and handling costs because of scientifically reduced weight.
8—Is only known prevention against termite destruction.
9—Enables you to borrow working parts and to pay only for ties in the job.
10—Is planned from job plans to use the right size of ties and the least number of ties to fit forming for fast, safe work.

Whether you are planning, designing or estimating on a concrete job—large or small—there are *Dollars* to be saved on *Form Work* by planning.

Richmond Services to Architects, Engineers and Contractors include recommendations on Form Tying Devices, Consultation on Form problems and Forming used, as well as Estimates on requirements, all without obligation.

The list of big jobs on which Richmond Form Ties have saved on form-work costs and speeded up completion is a blue-ribbon list of modern construction. It includes mammoth projects everywhere—and small contracts, too. There is a Richmond Tie engineered for every type of concrete construction. We plan a Tie to fit the work.

For information, write to our Planning Division.

RICHMOND SCREW
ANCHOR COMPANY, INC.
816 LIBERTY AVENUE • BROOKLYN, NEW YORK
Established 1911 •

TIME AND LABOR SAVING CONSTRUCTION DEVICES
FOR CONCRETE CONSTRUCTION

GAS RECOVERY. Servicing Sludge Gas Burning Equipment, W. M. Kunsch. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 626–629. Problems of servicing pipe lines, condensate and flame traps, pressure relief valves, gas meters, gas-fired boilers, and waste gas burners.

GREAT BRITAIN. Sewage Disposal in Rural Areas, G. I. Cotterell. *Surveyor*, vol. 103, no. 2712, Jan. 14, 1944, pp. 15–16. Discussion of factors which should be considered to determine design of works and appurtenances for disposal of sewage and wastes. Before Roy. Sanitary Inst.

PLANTS, GREAT BRITAIN. Visit to West Middlesex Main Drainage Committee's Perry Oaks Sludge Disposal Works. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 302–304. Description of works and operation; disposal of dry sludge to farmers.

PUMPING PLANTS, MAINTENANCE AND REPAIR. Equipment and Maintenance of Automatic Sewage Pumping Stations, E. R. Knight. *Instn. Civ. Engrs.—J.*, no. 1, Nov. 1943, pp. 37–38. Paper indicates, in general terms and without extensive theoretical treatment, basic reasons underlying selection of suitably detailed equipment, layout, and design, types of and liability to derangement which may lead to general breakdown, and their detection and remedy.

SEWAGE ANALYSIS. Estimation of Nitrous and Nitric Nitrogen in Sewage Effluents, V. H. Lewin. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 266–271, (discussion) 271–273. Methods for estimating nitrites and nitrates fall into three distinct types: volumetric, conversion to another substance, and colorimetric.

SEWAGE ANALYSIS. Modifications of Relative Stability Test for Sewage, S. H. Hopper and O. W. Briscoe. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 558–570. Report of study made on possibility of using dyes other than methylene blue to obtain indication of relative stability in less time than that required by standard methylene blue procedure. Bibliography.

SEWAGE ANALYSIS, SULFATE DETERMINATION. Determination of Inorganic Sulphates in Sewage, L. A. Allen. *Soc. Chem. Industry—J. (Trans. & Communications)*, vol. 63, no. 3, Mar. 1944, pp. 89–94. Benzidine method, as applied by Rosenheim and Drummond to analysis of urine, has been modified and converted into semimicro methods suitable for determination of sulfates in sewage; method is accurate and much more rapid than gravimetric procedure.

SEWAGE BACTERIOLOGY. Further Studies on Biology of Double Filtration Plant at Huddersfield, T. B. Reynoldson. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 116–135, (discussion) 135–139. Description of field and laboratory methods employed and month-by-month summary of observations on two filters followed by account and explanation of quantitative data collected.

SEWAGE FILTERS, BIOLOGICAL. Deep Enclosed Artificially Ventilated Filter Beds v. Ordinary Open Filter Beds, C. J. Dekema and K. A. Murray. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 311–317. Two biological filter beds (one ordinary open type, the other enclosed artificially ventilated type), for aerobic treatment of settled sewage.

SEWAGE FILTERS, BIOLOGICAL. Studies in Multiple Filtration by Deep Enclosed Artificially Ventilated Biological Filter Beds, C. J. Dekema and K. A. Murray. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 318–326. Abstract of report of investigations on sewage-purification process employing double filtration with enclosed filter beds; comparison of performance ratio with open filter and enclosed filter using single filtration.

SEWAGE TANKS, HEATERS. Digester Heating and Mixing Equipment, V. W. Bacon. *Sewage Works J.*, vol. 16, no. 3, May 1944, pp. 534–539. Details of digester heating by means of hot water coils or steam injection into sludge transfer pipes feeding digester; brief note on mixing equipment, and corrosion of equipment.

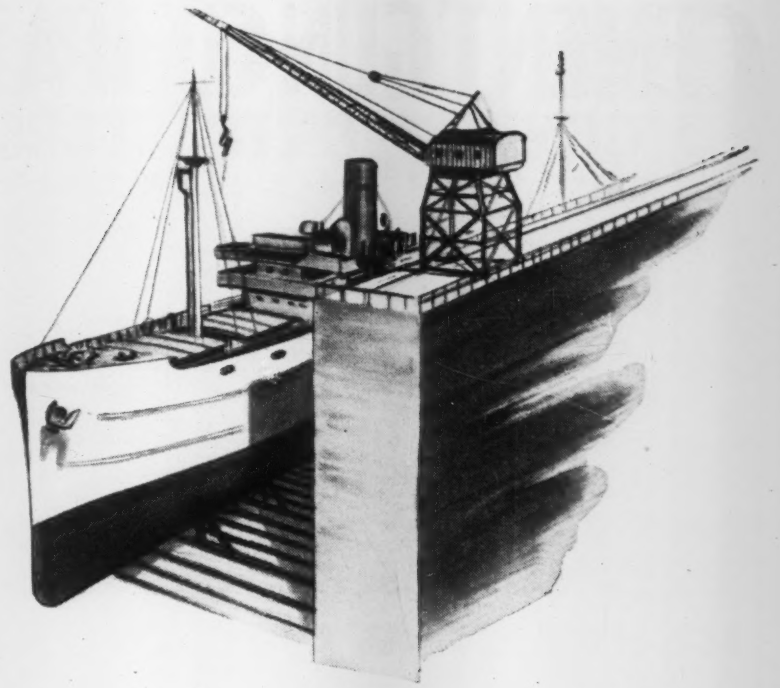
TREATMENT PLANTS, CANADA. Sewerage Developments and Prospects in Canada, A. E. Berry. *Eng. & Contract Rec.*, vol. 57, no. 26, June 28, 1944, pp. 21–22. Comprehensive review of sewerage practice in Canada; outline of possible developments in postwar period; review of use of activated sludge process in Canada; author's opinions on needed postwar sewerage construction in Canadian field. Extracts from paper before New York State Sewage Works Assn.

TREATMENT PLANTS, FINANCING. Ohio Plan for Financing Sewage Works Improvements, W. R, LaDue. *Am. Water Works Assn.—J.*, vol. 36, no. 3, Mar. 1944, pp. 323–329. Description of plan, whereby part of water-works surplus income is used for sewage works.

TREATMENT PLANTS, GREAT BRITAIN. Symposium on "Wartime Agricultural Activities on Sewage Works," L. F. Mountfort. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 295–302. Symposium of contributions and discussion by M. A. Kershaw, H. H. Stanbridge, and W. F. Snook.

TREATMENT PLANTS, POSTWAR. Sewage Purification Services in Relation to National Postwar Planning. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 329–331. Outline of recommendations for future planning of sewage purification.

The GAGE *that* GUARDS LIVES *and* *equipment*



By J. P. Smith, Industrial Engineering Division, General Electric Company

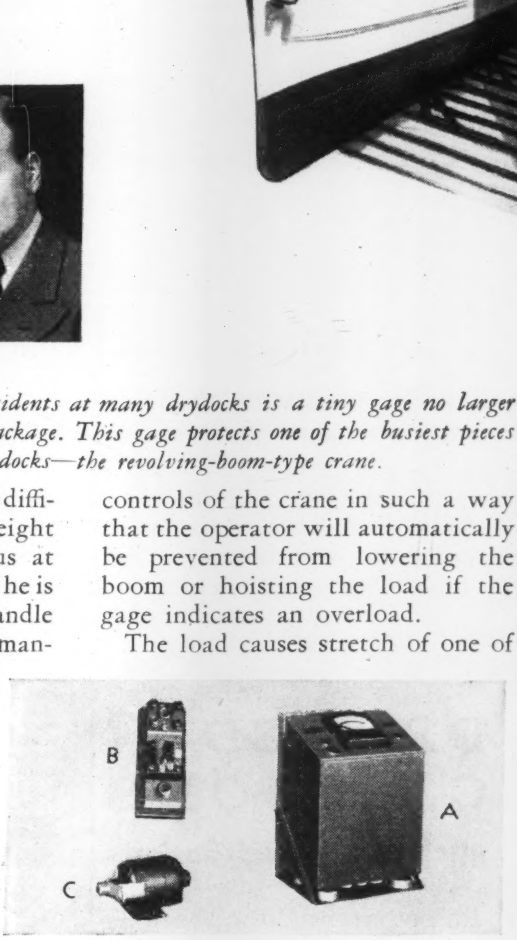
On guard against crippling accidents at many drydocks is a tiny gage no larger than half the size of a cigarette package. This gage protects one of the busiest pieces of equipment on the docks—the revolving-boom-type crane.

EVERY craneman knows the difficulty of determining the weight he is to handle, and the radius at which he can swing the boom. If he is overcautious, he hesitates to handle loads that the crane can safely manage, and thereby slows the work—in this case the servicing of ships. If he becomes overzealous and picks up more than the crane can safely handle, he runs the risk of overturning the crane, ruining material, and losing lives.

The crane-stability gage enters the picture

This gage (components shown in picture) has removed the necessity for guesswork in crane operation. Now, by glancing at an indicating instrument (A) the operator can determine whether he is "safe," or getting "out of bounds." It is possible even to interlock the crane-stability gage with the electric controls of the crane in such a way that the operator will automatically be prevented from lowering the boom or hoisting the load if the gage indicates an overload.

The load causes stretch of one of the crane's structural members to which the magnetic strain gage (B) is attached. This stretch is measured accurately by the gage by the changing of the gage's .005-inch air gap, which in turn causes movement of a pointer over the five-inch scale of the instrument near the operator.



The boom-angle compensator (C), which measures the boom angle, constantly corrects the reading as the radius changes. Thus the operator knows, at any radius, when he is handling his maximum safe load.

What the crane-stability gage does

1. Gives the operator a continuous, accurate indication of crane stability at all times.

2. Prevents unsafe operation by giving an alarm automatically when the load limit is reached. Also, the gage can often be interlocked with the crane controls.

3. Measures crane stability *whether the load is stationary or in motion.*

★

In thus eliminating one of the hazards of crane operation, G.E. has enabled workers in the heavy construction industry to obtain maximum output from expensive equipment, with less danger to life and material. Whenever you have an electrical problem, call on G-E engineers. They will be glad to work with you. *General Electric Company, Schenectady 5, N. Y.*

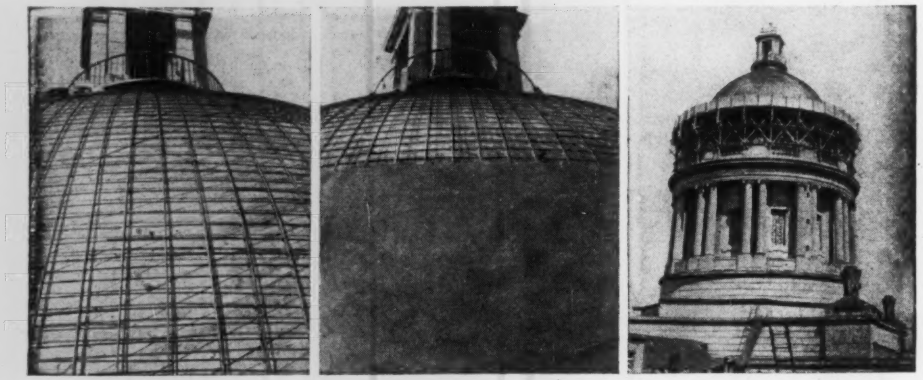
★

Buy all the BONDS you can—
and keep all you buy

GENERAL ELECTRIC

655-40-8498

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



REBUILT WITH "GUNITE"

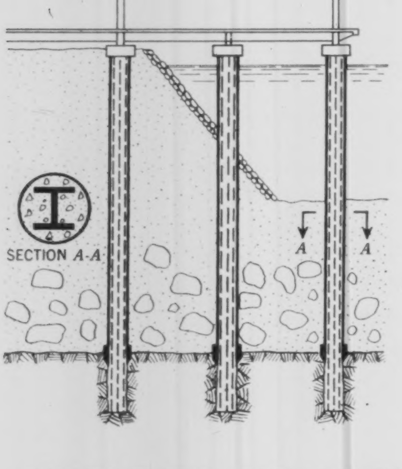
The photos show the dome of the Kentucky State Capitol, Frankfort, Ky., 48′-0″ dia. × 27′-0″ high. Originally built of wood, tin roofed, the dome deteriorated to such extent as to require replacement. We made this replacement with reinforced "GUNITE," under supervision of Roberts and Schaefer, Architects, of Chicago and Washington, D. C.

The photos show how the work was done over a temporary wooden form, and the completed job. The dome is 3″ thick, self-supporting and was covered with glazed tile to provide a decorative finish.

Our Bulletin 2200 describes hundreds of money-saving and profit-making uses of "GUNITE." Write for a copy.

MANUFACTURERS OF THE "CEMENT GUN"

FOUNDATIONS FOR POST WAR PIERS



DRILLED-IN CAISSONS
anchored in Rock Sockets

These patented foundations are designed for heavy loads—up to 1500 tons on a single caisson—and can be sunk to great depths through difficult ground.

Send for catalog and reprints descriptive of jobs done.

DRILLED-IN CAISSON CORPORATION
10 East 40th St.
New York 16, N. Y.
155 East 42nd St.
New York 17, N. Y.

TREATMENT PLANTS, SPRINGFIELD, Mass Solving Problems Caused by Oils in Sewage a Springfield, Mass., J. D. McDonald. *Wate Works & Sewerage*, vol. 91, no. 2, Feb. 1944, pp 53–55. Rapid increase of scum layer in fou digesters leads to several measures for control o grease and oils; details of methods adopted an results achieved.

TREATMENT PLANTS, WASTE UTILIZATIO Symposium on Manufacture and Utilization o Sewage Sludge as Fertilizer. *Inst. Sewage Purification—J. & Proc.*, 1942, pp. 196–206, (discussion) 206–208. Symposium at meeting of Mar 23, 1942; contributions and discussion by W Scott, H. Turner, S. M. Sykes, A. R. Ward, J. P Todd, and A. H. Bunting.

STRUCTURAL ENGINEERING

BEAMS AND GIRDERS, STRESSES. Moment-Distribution Method, J. A. Todd. *Instn. Ci Engrs.—J.*, vol. 22, no. 5, Mar. 1944, pp. 45–48 Object is to show that method of successive approximation developed by Prof. Hardy Cross and known as moment-distribution method when applied to problem of determining bending moments along horizontal beam subjected t vertical loads, yields convergent solution in which actual limits for error at each stage of proces may be assigned.

GREAT BRITAIN. Profession in Postwa Conditions. *Structural Engr.*, vol. 21, no. 12 Dec. 1943, pp. 483–491, (discussion) 491–496 Author contends that any consideration of future probabilities must be based upon conditions a they are and that much construction of war period must be ignored in peacetime planning; some rehabilitation projects discussed; function of structural engineer in housing.

POSTWAR. Structural Engineer's Place in Postwar World, A. C. Bossom. *Structural Engr.*, vol. 21, no. 11, Nov. 1943, pp. 436–453. Future of structural engineering falls into two categories as follows: examination and correction of existing defects inherited as legacy from our prewar rule-of-thumb procedures; systematic preparation for new and better things that are within reach if sufficient foresight, endeavor, and research are displayed

STRUCTURAL ANALYSIS, MODELS. Structural Analysis by Models. *Engineering*, vol. 157, no. 4078, Mar. 10, 1944, pp. 191–192. Main emphasis of recent model testing has been on use of two-dimensional models; discussion of direct and indirect methods of testing these.

WATER WORKS ENGINEERING

GALVESTON, TEX. Recent Water Works Improvements at Galveston, Texas, G. Thornton. *Water Works Eng.*, vol. 97, no. 12, June 14, 1944, pp. 680–682 and 719. Details of improvements in which water system was expanded, chloride content of water lowered, adequate chlorinating equipment installed, pipe lines constructed, and new reservoirs built.

GENERAL SITUATION, UNITED STATES. Reconnaissance on Water Works Front, E. L. Filby. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, pp. 820–824. Various ideas on management, planning, public relations, accident prevention, etc., resulting from author's travel from coast to coast.

LAWS AND REGULATIONS. Higher Court Decisions in 1944, L. T. Parker. *Water Works Eng.*, vol. 97, no. 12, June 14, 1944, pp. 683–684. Review of higher court decisions on injuries to persons and property in water works cases.

PANAMA CITY, FLA. Water Works Design Under Wartime Conditions, W. W. Gillespie. *Am. Water Works Assn.—J.*, vol. 36, no. 6, June 1944, pp. 662–668. Discussion of problems encountered in providing improvements in water works to meet war demands of new shipyard, air field, housing, etc.; wells, surface reservoir, aerator, and distribution system described.

POSTWAR. Outlook for Postwar Activity. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 560–566, 568, 608. Symposium of views of ten water works leaders on work to be done and its accomplishment: Every Community Has Water Supply Needs and Should "Blueprint Now," S. B. Morris; Challenge to Assume Leadership; B. A. Bennett; About 6,000 Incorporated Communities Need Public Water Supply, J. K. Hoskins; Manufacturers Are Ready to Produce, C. A. McGinnis; "Hold the Line" Unit Limits of War Demands Are Reached, A. E. Gorman: Shortage of Trained Engineers Expected, T. Saville; Extensive Programs for Large Cities, W. W. Hurlbut; Deferred Maintenance and Replacement Demand Will Be Large, W. R. La Due; and New Blood Needed in Water Departments, R. W. Esty.

POSTWAR. Postwar Water Works Prospects, E. Eaves. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, pp. 825–826. Water Works projects proposed up to March 31, 1944, for postwar construction total $299,535,000; status of postwar water-works construction planning by states.

UNITED STATES. WPB Viewpoint on What's Ahead for Waterworks Utilities, A. E. Gorman. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, pp. 813–815. Although military necessities will continue to determine availability of materials, War Production Board is geared to meet requests from utilities in order that adequate water service will not be impaired.

WATER WELLS. Abyssinian Driven Tube Well Has Virtues in Porous Soils, C. J. Robb. *Eng. News-Rec.*, vol. 132, no. 22, June 1, 1944, p. 824. Construction and advantages of driven tube well are briefly given.

If you could write your own specifications for an IDEAL PILE . . .

What more would you want than this?

ON thousands of jobs . . . large buildings, bridges, wharves, highway overpasses, and airports . . . Monotube tapered piles have proved themselves the last word in modern cast-in-place piled foundations. These strong, light-weight steel piles go down faster, handle easier, and lend themselves to quick, sure inspection before concreting. Tapered, cold-rolled construction gives them extra strength without extra weight. They can be driven with average job equipment . . . and *quickly extended* on the job to meet varying soil conditions. Available in a gauge, size, and taper to meet any requirement. The services of our consulting engineers are available now as always. Also, write for Catalog 68A. The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Tapered Piles

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

SEWERAGE AND SEWAGE DISPOSAL

Sewage Treatment, Activated Sludge. Application of Sludge Index Test to Plant Operation, D. E. Bloodgood. *Water Works & Sewerage*, vol. 91, no. 6, June 1944, pp. 222–224. Explanation of application of sludge index; nomograph for applying sludge-index test to plant control.

Sewers, Construction. Double Sewer Siphon Pulled Into Place. *Eng. News-Rec.*, vol. 132, no. 24, June 15, 1944, pp. 880–881. Two cast-iron pipes 24 in. in diameter for double siphon across tidal stream were pulled into place by unique method; power was supplied by steel cable from crawler crane; outer ends of pipe were supported on timber toboggan; pipes were plugged and empty drums attached to provide buoyancy.

Treatment Plants, Maintenance and Repair. Efficient Maintenance Needed for Continuous Operation. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 7, July 1944, pp. 343 and 361. Review of repairs and replacements required by Guggenheim process plant at New Britain, Conn. From annual report of Sewage Disposal Commission.

Treatment Plants, Maintenance and Repair. Sewage Plant Maintenance Round-Table, L. S. Kraus. *Sewage Works J.*, vol. 16, no. 4, July 1944, pp. 825–835. Round table on maintenance of electrical and mechanical equipment, painting maintenance, activated sludge plant operation, and trickling-filter operation.

Water Pollution. Fitting Sewage Plant Effluent to Receiving Stream, E. J. M. Berg. *Sewage Works J.*, vol. 16, no. 4, July 1944, pp. 835–839. Sewage plant operator must have clear understanding of B.O.D. and dissolved oxygen, use chlorination wisely, and study recovery power of stream.

Water Pollution. Oxidants and Reductants in Sewage Plant Effluents and Streams, R. Eliassen. *Water Works & Sewerage*, vol. 91, no. 6, June 1944, pp. 219–221. Revaluation of significance and applicability of relative stability and B.O.D. tests, study of fact as involved in tests, and evaluation of influence of nitrates on receiving stream.

STRUCTURAL ENGINEERING

Cranes, Gantry. Turntable Car Used in Erecting Girders. *Eng. News-Rec.*, vol. 132, no. 24, June 15, 1944, pp. 870–871. Description of method used in erecting 100-ton girders on power house gantry crane at Kentucky Dam.

Stresses, Analysis. Lattice Analogy for Solution of Stress Problems, D. McHenry. *Instn. Civ. Engrs.—J.*, no. 2, Dec. 1943, pp. 59–82. Paper describes computation method which may be adapted to numerical solution of almost any type of two-dimensional stress problem involving elastic materials; two-dimensional section may be of any shape, and it may be subjected to any desired boundary loading or displacement, or to non-uniform body forces or temperature changes; section may be composite, of two or more materials, or it may contain reinforcement.

Tanks, Design. Design of Ring Girders for Horizontal Tanks, A C. Barton. *Petroleum Refiner*, vol. 23, no. 6, June 1944, pp. 207–217. Analysis of problem of supporting large horizontal vessels; two rings at supports, 90° to shell, provide adequate moment of inertia to resist internal pressure and circumferential bending moment; longitudinal stresses are also considered.

Welded Steel Structures. Welded Structures of Varied Types Indicate Wide Range of Postwar Uses. *Construction Methods*, vol. 26, no. 6, June 1944, p. 57. Brief notes and illustrations of swimming pool, storage sphere for liquefied natural gas, bus garage, "vertical bullet," and industrial plant, of welded steel.

TRAFFIC CONTROL

Signs, Signals, and Markings. Views of Highway Authorities on Plastic White Lines. *Surveyor*, vol. 103, no. 2721, Mar. 17, 1944, p. 123. To obtain direct information as to considered merits of material, Road Research Board requested Ministry of War Transport to obtain views of highway authorities so that information could be available concerning mileage of the lines now in service—their visibility at night, annual cost, and difficulties encountered during laying.

TUNNELS

Air Raid Precautions, Shelters. London's Tunnel Shelters for Air-Raid Protection Will Serve as Postwar Subway Tubes, S. P. Kernahan. *Construction Methods*, vol. 26, no. 8, Aug. 1944, pp. 82–83, 142, 144, 146, 149. Deep tunnel shelters, 1,200 to 1,400 ft long, driven from shafts near existing stations and parallel to existing underground railway lines, are to be incorporated in proposed north-south express tubes.

Rails, Welding. Erie Welds Otisville Tunnel Rails in Track by Thermit Full-Fusion Process. *Ry. Eng. & Maintenance*, vol. 40, no. 7, July 1944, pp. 608–611 and 614. Using new-type weld and doing work in place, road has connected rails in east-bound track in mile-long tunnel into continuous lengths; characteristics of weld and manner in which it was installed in tunnel are described.

Water Supply, New York. New Rondout Water of Great Benefit to New York, T. Hochlerner. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 592, 595, and 660. Discussion of utilization of water of Rondout Creek through Delaware Aqueduct to West Branch Reservoir of Croton System.

WATER PIPE LINES

Design. Some Considerations in Design of Water Distribution Systems, W. D. Hurst. *Eng. & Contract. Rec.*, vol. 57, no. 26, June 28, 1944, pp. 17–21. Three appendixes to article presented before Am. Water Works Assn.; circle method; chart for application of Hardy Cross method to determine actual flow distribution in water supply network; cost of repair of water meters.

WATER TREATMENT

Filters, Cleaning. Keeping Filters Clean with Chlorine, H. W. Poston. *Water Works & Sewerage*, vol. 91, no. 6, June 1944, p. 209. Description of method used at Ottumwa, Iowa, Water Works.

Filtration, Flocculation. Colloidal Silica as Aid to Floc Formation, H. R. Hay. *Water Works & Sewerage*, vol. 91, no. 6, June 1944, pp. 211–215. Types of silica coagulant aids are described and tests and procedures indicated.

Filtration, India. Slow Sand Filters, G. Ghosh. *Indian Eng.*, vol. 115, no. 4, Apr. 1944, pp. 133–134. Report on experiments designed to study following characteristics of slow sand of size usually obtained in Bengal: rate of filtration with varying head; variation in rate of filtration with time; relation between rate of filtration and turbidity of water; coordinating above points with bacteriological and chemical quality of filtered water obtained.

Fluorine, Michigan. Fluorine in Water Supply Closely Studied in Michigan. *Water Works Eng.*, vol. 97, no. 10, May 17, 1944, pp. 486–487 and 503. Summary of papers at joint meeting of Michigan Section, Am. Water Works Assn., and Michigan Conference on Water Purification. Papers include: Fluorine and Dental Decay, C. R. Taylor; Stream Pollution in Relation to Public Water Supplies, M. J. Adams; Iron Removal and Red Water Problems, T. L. Vander Velde.

History, United States. Successful Fight Against Water Borne Disease, N. J. Howard. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 579 and 616–618. History of accomplishments in elimination of water-borne disease in United States.

Industrial. Typical Water Analyses for Classification with Reference to Industrial Use, W. D. Collins. *Am. Soc. Testing Matls.—Preprint No. 96*, for meeting June 26–30, 1944, 4 pp. Tabular data given; water analyses given in table were selected as typical of waters that are encountered in operation of industrial establishments in United States; content of gases may be variable for water from given source; hydrogen-ion concentration; carbon dioxide; hydrogen sulfide; oxygen; color; suspended sediment.

Ozone. Treatment of Water by Ozone, M. T. B. Whitson. *Instn. Civ. Engrs.—J.*, no. 2, Dec. 1943, pp. 83–97, 2 supp. sheets. History of process; standard ozone plants; description of plant at Ashton-under-Lyne and experience gained there through use of ozone process. Bibliography.

Recent Experiments. Lessons Learned from Recent Purification Experiments, W. U. Gallaher. *Water Works Eng.*, vol. 97, no.13, June 28, 1944, pp. 761–762, 801–802. Summary of papers at meeting of Water Purification Div. of Am. Water Works Assn.: Discussion of breakpoint chlorination; effect of chlorine on organisms, effect on odors; other purification problems.

Sedimentation. Removing Coagulated Materials. *Water Works Eng.*, vol. 97, no. 8, Apr. 19, 1944, p. 402. Discussion of clarification by sedimentation and consideration of special types of clarifying devices.

Softening, Great Britain. Britain's Water Supplies: Are They Too Hard? D. G. Davies. *Surveyor*, vol. 103, no. 2716, Feb. 11, 1944, pp. 63–64. Survey of desires of British public for hard or soft water; advantages and disadvantages of each; distribution of hardness of water supplies of England and Wales; softening processes discussed.

Water Bacteriology. Bacterial Reduction by Chemical Treatment, H. W. Gehm. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 7, July 1944, pp. 338–339. Description of experiments to determine relative merits of various chemical coagulation processes for bacterial removal.

Water Bacteriology. Euglena at Ryton Waterworks, A. T. Palin. *Water & Water Eng.*, vol. 47, no. 577, June 1944, pp. 263–271. Account of methods used in elimination of Euglena at water works in Coventry, England; experimental results show superiority of chlorine over copper sulfate treatment, especially when dealing with hard alkaline water.

Water Pollution. Sanitation of 100,000 Miles of Streams in Pennsylvania, H. E. Moses. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 7, July 1944, pp. 334–335, 358. Program of Sanitary Water Board for improvement of stream conditions.

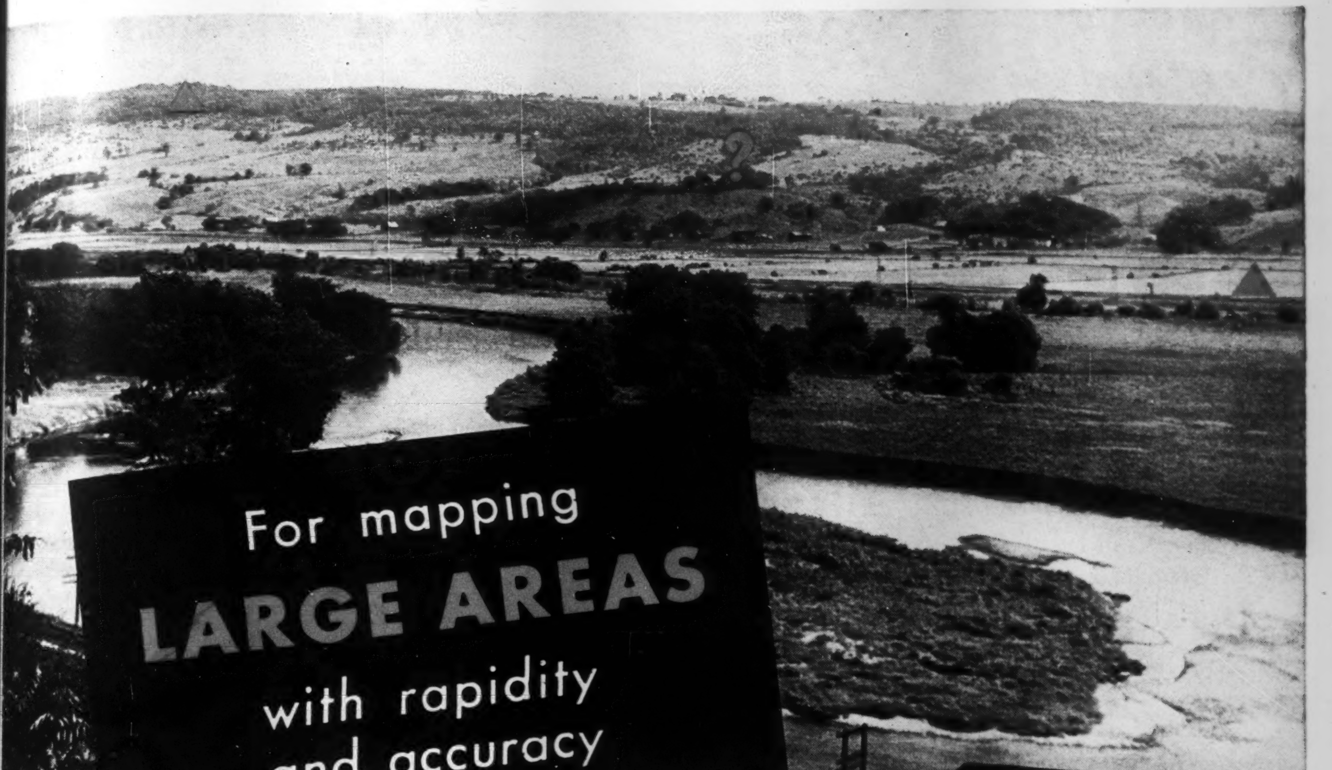
Water Pollution. Stream Pollution Survey of Black Warrior River, G. H. Dunstan. *Sewage Works Eng.*, vol. 15, no. 7, July 1944, pp. 336–337 and 359. Account of survey made of river in Alabama as to hydrometric factors, sanitary condition of water and pollution.

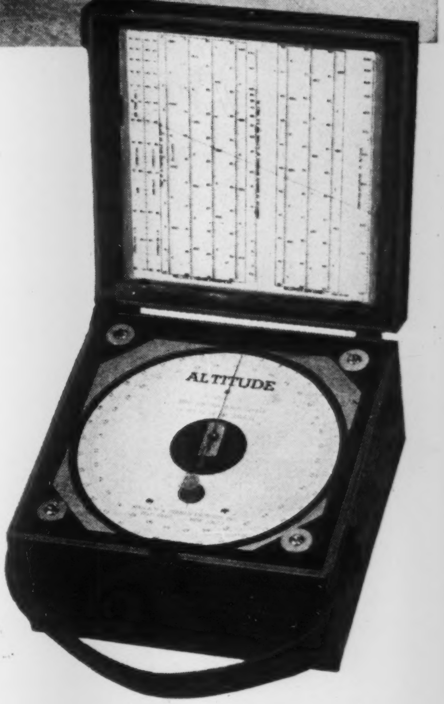
WATER WORKS ENGINEERING

Algiers. Supply of Algiers, Africa, Distributed in Unusual Way, M. Raineau. *Water Works Eng.*, vol. 97, no. 10, May 17, 1944, pp. 485–486. Water purchased by property owner and flows from his tank to separately metered tenants; water supply is obtained entirely from wells.

De Soto, Kans. Dozen Different Kinds of Water Delivered by New Plant, W. S. Lozier. *Water Works Eng.*, vol. 97, no. 8, Apr. 19, 1944, pp. 394–396. Sources of water selected, characteristics, treatment adopted, and quality of processed water in water system delivered to Sunflower Ordnance Works.

Distribution Systems, Los Angeles, Calif. Distribution Practices at Los Angeles, Calif., R. E. Hemborg. *Water Works Eng.*, vol. 97, no. 11, May 31, 1944, pp. 596, 599, 628–629. Outline of system; amount of maintenance and operation work; how distribution work is carried on and equipment used.





▲ Known Elevations

W&T SENSITIVE ALTIMETER

New developments in precision altimetry permit the mapping of large areas with far greater speed and convenience than heretofore possible, with no sacrifice in accuracy.

By using W&T Sensitive Altimeters in connection with the Two-Base Method of Precise Altimetry, elevations can be determined to within a few feet, making it simple to map 10 foot contours with exactitude.

The rapidity and comparative ease with which the readings can be made result in large savings of time and expense over spirit level surveying.

The altimeter is available in two ranges: 0 to 7,000 feet and 0 to 16,000 feet, with 10 foot and 20 foot graduations respectively.

The instrument is accurate to one part in one thousand. The dial is five inches in diameter and is custom calibrated in feet altitudes. The Altimeter is compensated so that corrections to readings are not required for variations in instrument temperature.

For convenient portability the instrument is supplied in an oak carrying case, measuring 6 x 6 x 4 inches. The total weight is 2½ pounds.

Write for Illustrated Technical Bulletins

WALLACE & TIERNAN PRODUCTS, INC.

BELLEVILLE 9 **NEW JERSEY**

A-20

CUSTOMERS ARE CLOCK WATCHERS-

DON'T let your reputation for promptness lie around on the shipping room floor. When a customer marks his order "RUSH"—call for AIR EXPRESS pick-up *and get it on its way as early in the day as possible!* That's the secret of fastest delivery by AIR EXPRESS—a service that moves cargo on swift Airlines schedules around the clock, for war and reconversion jobs.

SPECIFY AIR EXPRESS
A Money-Saving, High-Speed Tool for Every Business

With additional planes and space available for all types of traffic, 3-mile-a-minute Air Express directly serves hundreds of U. S. cities and scores of foreign countries. And shippers nationwide are now saving an average of more than 10% on Air Express charges—as a result of increased efficiency developed to meet wartime demands.

WRITE TODAY for "North, East, South, West"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-10, Railway Express Agency, 230 Park Avenue, New York 17, N. Y., or ask for it at any local office.

AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

GREAT BRITAIN. Water Supply: Does I Tend Towards Regionalization? L. Costley, *Water & Water Eng.*, vol. 47, no. 577, June 1944, pp. 255–257. Abstract of report discussing ex- tent of cooperation developed between local areas need for additional supplies, methods of meetin these needs, and recommendations.

HAMPTON ROADS, VA. Hampton Roads Are Satisfies Huge War Demands, E. H. Aldrich *Water Works Eng.*, vol. 97, no. 11, May 31, 1944 pp. 580, 583–584, 587, and 616. Extensions raised available water supply in two years to approximately 80 mgd from previous mark of 23 mgd.

MIAMI, FLA. History and Description of Miam Waterworks Project, G. A. Weigand. *U.S. Piper* vol. 17, no. 2, June 1944, pp. 15–21. Details pertaining to construction of modern water supply and treatment plant for City of Miami and its environs; illustrations given.

MILITARY ENGINEERING, WATER SUPPLY. Water Purification in Italy, W. J. Diamond *Military Engr.*, vol. 36, no. 223, May 1944, pp 153–155. Description of methods used by U. S. Army Engineers in supplying troops and civilians with pure water.

NEW BEDFORD, MASS. Postwar Plans fo Water System of New Bedford, Mass., H. C Mandell. *New England Water Works Assn.—J.* vol. 58, no. 1, Mar. 1944, pp. 7–13. Descrip tion of eight projects which are necessary t city's water works system, to be submitted t special Commission on Postwar Planning; summary of projects with estimated costs and ma hours of labor is given.

NEWPORT, R. I. Water Supply for Island City *Eng. News-Rec.*, vol. 132, no. 26, June 29, 1944 pp. 944–947. Construction to provide auxiliary water supply included: Low concrete dam acros tidal pond to create 400-mg reservoir, earth dam to make equal storage available, 4-mile pipe line 4-mgd treatment plant, and 4,000,000-gal plain concrete reservoir for filtered water storage measures taken to eliminate salt in tidal pond.

POSTWAR. Postwar Planning Featured at Milwaukee. *Water Works Eng.*, vol. 97, no. 14, July 12, 1944, pp. 830–833. Summary of papers at general and special sessions of Am. Water Works Assn.: Planning for Postwar Construction, W. N. Carey; Promotion of Water and Sewage Works Development, E. L. Filby; Concrete Facts Related to Postwar Planning of Water Works in New York State, E. Devendorf; Plans for Postwar Water Works Construction in Southwest, H. A. Hunter; Financing Water Works Improvements in Pacific Northwest, G. B. Schunke.

RECENT DEVELOPMENTS. Notes on Waterworks Developments. *Eng. News-Rec.*, vol. 133, no. 2, July 13, 1944, pp. 38–40. Extracts from papers at conference of Am. Water Works Assn. in Milwaukee, June 13–16: Byproducts from Lime Sludge, R. T. Sheen and others; Diatomite Filters for Troops, H. H. Black and C. H. Spalding; Costs of Water Works Structures, C. B. Burdick; Depreciation of Public Utilities, L. R. Howson; Water Interconnections, H. T. Critchlow.

RESEARCH. Research in Water Engineering, C. A. Bradley. *Water & Water Eng.*, vol. 47, no. 577, June 1944, pp. 252–254. Discussion of research needs in field; present facilities for research in water engineering and future requirements; materials in present use; design and construction of new works; maintenance and operation; organization of research.

ST. LOUIS, MO. Water Works Improvements at St. Louis, Mo., T. J. Skinker. *Water Works Eng.*, vol. 97, no. 13, June 28, 1944, pp. 750–753. Description of present system and proposed changes.

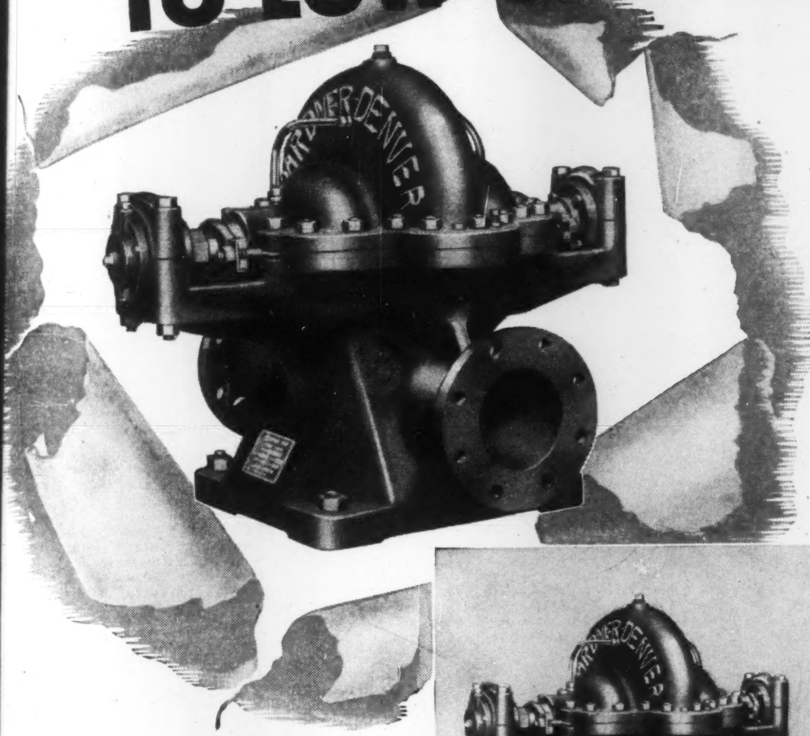
SURVEY. Water Engineering. *Surveyor*, vol. 103, no. 2713, Jan. 21, 1944, pp. 31–33. Survey of information and published data relating to water supply engineering during past year covering future of supply undertakings; river boards; resources; dams and embankments; silting of reservoirs; purification; distribution system; waste prevention.

WAR PROJECTS. Water Utility Construction on War Projects, M. T. Jones. *Eng. News-Rec.*, vol. 132, no. 26, June 29, 1944, pp. 954–955. From experiences with water and sewer construction on large war projects, author tells of some things that might be handled differently under similar emergency conditions; review of several problems of planning and construction; necessity for coordination of operations, careful inspection, and proper sterilization of mains prior to use.

WATER DISTRIBUTION SYSTEMS. Analyzing Your Distribution, R. G. Kincaid. *Water Works Eng.*, vol. 97, nos. 2, 6, and 10, Jan. 26, 1944, p. 72; Mar. 22, pp. 286–288; May 17, pp. 482–483. Questions to be answered and operations to be performed in analysis; determination of critical demands on system and effect of storage, using illustration load curves; discussion of methods used in assembling basic data required to complete setting up of problem to be analyzed.

WATER WELLS. Rock Wells, L. A. Smith. *Water Works Eng.*, vol. 97, no. 13, June 28, 1944, pp. 763–764. Question-and-answer discussion of rock wells.

WE ELIMINATED THE BARRIERS TO LOW-COST PUMPING!

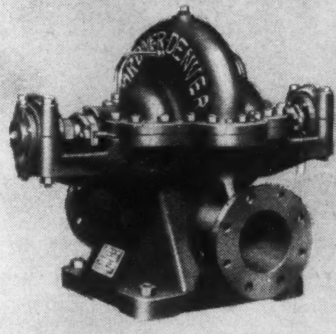


ACKWATERS—eddies . . . sudden velocity changes . . . all these barriers to pump-ficiency have been eliminated in Gardner-enver Centrifugal pumps.

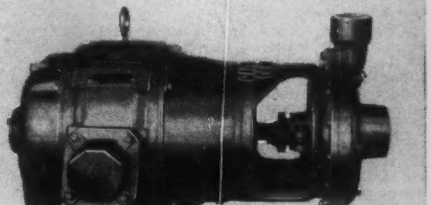
For by rigidly controlling foundry prac-ces . . . by assuring a minimum of obstruc-on in the line of flow and properly pro-rtioning water passages, Gardner-Denver gineers have designed a pump that de-vers an even, uniform flow of water.

Every proved mechanical and hydraulic ature that contributes to efficient low-st pumping has been embodied in ardner-Denver Centrifugals. Impellers d casings are cast to a special Gardner-enver formula that assures the maximum long-life and trouble-free service.

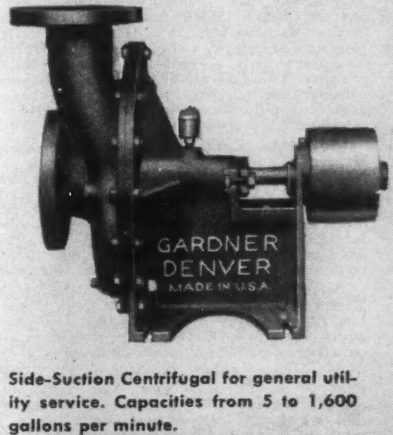
r complete details and specifications on Gardner-nver Centrifugals, write Gardner-Denver mpany, Quincy, Ill.



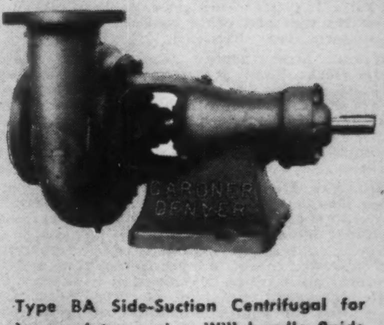
Horizontally Split-Case, Double-Suction Centrifugal for large capacities and heads up to 350 feet.



Close-Coupled Centrifugal can be installed in any position on floor, wall or ceiling. Capacities from 30 to 1,200 gallons per minute.



Side-Suction Centrifugal for general utility service. Capacities from 5 to 1,600 gallons per minute.



Type BA Side-Suction Centrifugal for heavy duty service. Will handle fluids containing solids or stringy material.

ENGINEERING QUALITY • Since 1859

GARDNER-DENVER Since 1859

CURRENT PERIODICAL LITERATUR

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

Arch, Strengthening. Reinforcing Brick Arch Bridge Under Railroad Traffic, R. D. McGilvra. *Eng. News-Rec.*, vol. 133, no. 2, July 13, 1944, pp. 55–56. Traveling arch forms and typical tunnel concrete set-up used in reinforcing brick masonry-arch bridge on New York division of Pennsylvania Railroad's main line, without interfering with high-speed traffic.

Bascule. New Type Bascule for Skewed Crossings, C. D. Hanover, Jr. *Eng. News-Rec.*, vol. 132, no. 24, June 15, 1944, pp 872–876. Single-span skew bridge is distinguished by main girders "bent" at channel line, forming forward and rearward arms of lead; bridge provides clear span equal to channel width; description of knee-girder skewed bascule bridge on Hamilton Ave. crossing of Gowanus Canal, Brooklyn, N.Y.

Bridges, Railroad. Impact Tests on Pennsylvania RR. *Ry. Gaz.*, vol. 80, no. 25, June 23, 1944, p. 644. Results of tests on new type of steel-plate girder and concrete deck composite-span compared with those on open-deck spans and with American Railway Engineering Assn. calculations.

Concrete, Construction. Construction of Bridge Over Railway, L. E. Hunter. *Concrete & Constr. Eng.*, vol. 39, no. 7, July 1944, pp. 177–181. Two-span structure built to carry 24-ft road and 5-ft path over double line of railway and road; excavation, drainage, and shuttering described.

Concrete Frame. Simplified Concrete Rigid Frame Design, J. C. Spotts. *Eng. News-Rec.*, vol. 133, no. 4, July 27, 1944, pp 100–103. Rigid-frame concrete bridges with curved soffit decks are designed quickly and with minimum computations by first assuming relative proportions of frame dimensions, completing detailed analysis, and finally assigning true numerical values to span, height, and crown thickness.

Design. Problems in Design of Alaska Highway Bridges, R. Archibald, W. K. Greene, and J. W. Guppy. *Eng. & Contract. Rec.*, vol. 57, no. 29, July 19, 1944, pp. 54–58, 100, 102. Permanent steel, timber, and concrete structures include bridges of all sizes and design types; transportation problems; floor construction; description of Peace River, Liard River, and Teslin River bridges; illustrations given.

Design. Small Bridges for Agricultural Traffic. *Surveyor*, vol. 103, no. 2724, Apr. 7, 1944, p. 159. Loading, construction materials, and suitable types of bridges capable of carrying heavy tractors and other similar machinery to remote farm areas, discussed.

Floor. Strengthening Strategic Interstate Bridge Deck. *Roads & Streets*, vol. 87, no. 5, May 1944, pp. 68 and 97. How panels of scrap rail were placed full width with minimum traffic delay on important bridge in Southwest; replacing old timber deck; old bridge deck consisted of 2 by 6 laminated redwood planks with asphalt mix surfacing.

Highway, Design. Use of Twin Bridges Simplifies Design. *Eng. News-Rec.*, vol. 133, no. 2, July 13, 1944, pp. 52–54. Twin bridges over Big Piney River in Missouri are of identical layout built on dual-lane express highway to permit two roadways to act independently, thus avoiding uncertain stresses developed in wide deck of single structure; reinforced concrete deck-girder spans used for approaches and deck arches for main river crossings; 6-ft raised medium strip separates two structures.

Highway, Latin-America. Bridges of Pan-American Highways, E. W. James. *Western Construction News*, vol. 19, no. 8, Aug. 1944, pp. 82–86. Description of bridges constructed along highway system.

Highway, Pan-American. New Bridges Unite Americas, E. W. James. *Roads & Bridges*, vol. 82, no. 8, Aug. 1944, pp. 53–57, 99–100. New bridges along Pan-American Highway route through 18 countries are playing important role of tying Americas together in closer bonds and of accelerating development, production, and transport of critical war materials; brief description of international bridges now linking ten American Republics; extensive road and bridge work still needed in South America.

Highway, Reconstruction. Arkansas Repairs Flood-Damaged Bridge. *Eng. News-Rec.*, vol. 133, no. 10, Sept. 7, 1944, pp. 299–300. Additional waterway provided beneath flood-damaged bridge over Arkansas River by replacing 1,600 ft of washed-out approach fill with concrete deck girder spans; simplified design permits speedy construction.

Highway, Washington, D.C. New Bridges Speed Washington Traffic, H. J. Engel. *Eng. News-Rec.*, vol. 132, no. 26, June 29, 1944, pp. 938–941. Flow of traffic to Potomac River bridges improved by construction of several bridges along 14 St. and extension of Independence Avenue, designed to combine beauty and utility; light reinforced concrete rib-type structure of three 56-ft span rigid frames masked with stone-faced, arched curtain walls built at one location; reinforced concrete continuous T-beam construction used for parallel three-span bridge; groups of continuous steel beam spans at third location.

Lift, Submergible. Hull Bridge, Iraq, G. B. G. Hull. *Engineer*, vol. 177, nos. 4608 and 4609, May 5, 1944, pp. 343–345, May 12, pp. 362–364. Points in favor of submerging method of construction; bridge is of high tensile steel with maximum working stress of 11.25 tons per sq in.; illustrated description of construction methods; lifting arrangements; bridge is purely wartime work, and all that can be claimed for it is that it satisfactorily meets, for time being, military demands.

Maintenance and Repair. State Highway Bridge Maintenance Involves Care of 4,633 Structures, H. D. Stover. *Calif. Highways & Pub. Works*, vol. 22, no. 3 and 4, March-April 1944, pp. 12–15, 25. Methods and equipment used by Bridge Dept. of Division of Highways in maintenance of California state highway bridges during war emergency when overloading of structures is often necessary for movement of heavy equipment.

Military. Bailey Bridge, S. G. Galpin. *Engineering*, vol. 157, no. 4094, June 30, 1944, pp. 507–508. Illustrated description of new bridge named for D.C. Bailey, of (British) Ministry of Supply, who played leading part in its development; despite fact that different components are relatively few in number, system of construction is very adaptable, so that great variety of different bridges can be erected according to military requirements.

Movable. Controls for Movable Bridges, C. P. Hamilton and G. W. Hewmann. *Eng. News-Rec.*, vol. 132, no. 18, May 4, 1944, pp. 664–670. Modern control for movable bridges demands careful design of operational equipment, efficient electrical facilities and foolproof safety devices; latest developments in these vital design features are reviewed as aid to program of movable bridge construction expected to be revived after war.

Pontoon. Invasion Prelude—Bailey Bridge Training, W. G. Bowman. *Eng. News-Rec.*, vol. 133, no. 6, Aug. 10, 1944, pp. 158–161. Account of demonstration by Engineer troops in construction of Bailey pontoon bridge.

Pontoons. Steel Pontoon Cells in South Seas, N. A. Bowers. *Eng. News-Rec.*, vol. 133, no. 4, July 27, 1944, pp. 106–109. Description and use of steel box pontoon units, 5 by 5 by 7 ft used by Navy in wharves, barges, bridges, drydocks, storage tanks, and so on; construction of floating wharf and welding technique described.

Steel Arch. Problems in Design of Alaska Highway Bridges, R. Archibald, W. K. Greene, and J. W. Guppy. *Am. Highways*, vol. 23, no. 3, July 1944, pp. 10–11, 15–17. Article explains how difficult problems arising in construction of bridges were overcome and planned schedule was met; new steel structures with span lengths of 40 ft and over, which required approximately 16,000 tons of steel, are discussed; for speed a economy it was essential to adopt constructi standards suitable for major portion of bridges.

Steel, Alaska Highway. Problems in D sign of Alaska Highway Bridges, R. Archibal W. K. Greene, and J. W. Guppy. *Eng. J.*, v 27, no. 6, June 1944, pp. 353–356. Discussi of steel bridges, on Alaska Highway; standar adopted, elements of design, fabrication, and shi ment on Peace River, Leard River, Hyland Riv Upper Liard River, Tanana River, and Tes River Bridges.

Steel, Australia. Design of Welded Ste work in Bridgewater Bridge, Tasmania, D. Isaacs. *Civ. Eng.* (London), vol. 39, no. 4 Apr. 1944, pp. 90, 92–94, and 96. Bridgewat Bridge is combined road and rail structure cro ing estuary of River Derwent 12 miles upstrea from Hobart; new structure is 1,109 ft long co sisting mainly of welded 57–ft 6-in. plate gird spans carried on concrete piers; center spa are of welded-truss type, including lift span givi clearance of 98 ft 6 in.

Viaducts, Maintenance and Repairs. R pair of Bombed Viaduct. *Civ. Eng.* (Londo vol. 39, no. 452, Feb. 1944, pp. 39–41. T tracks suspended in mid air 70 ft from grou across 70-ft gap, where a few seconds befo there had been pier and two arches, was wre left by raider's bomb on Southern Railway v duct at Brighton; in five weeks trains were ru ning again; in four months viaduct was co pletely restored; brief summary of details of h this speedy repair was effected.

BUILDINGS

Auditoriums, Roofs. Precast-Arch Ribs f Auditorium Roof, W. L. Zeigler. *Eng. New Rec.*, vol. 133, no. 2, July 13, 1944, pp. 35–3 Three-hinged pre-cast concrete-arch ribs used span 90 ft with 26-ft rise; crown hinge sho piece of pipe 10 in. in diameter is welded to rei forcing of one-half rib section, while other r section bears on pipe; lower ends of arches a rounded to fit in circular bearings in pre-cast se blocks; roof framing is wood.

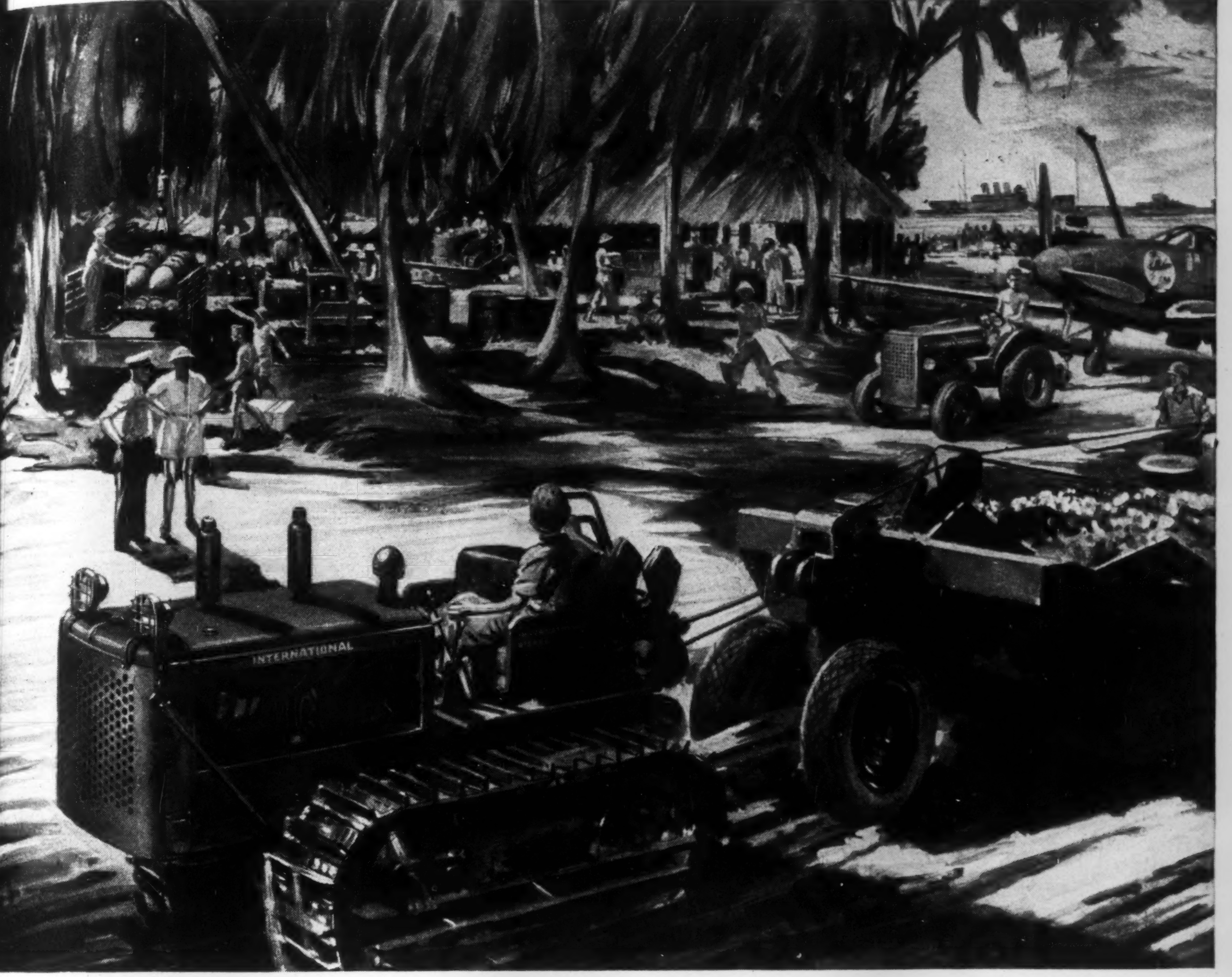
Construction. Substantial Temporary Co struction Used for Naval Training Station, T. Creighton. *Eng. News-Rec.*, vol. 133, no. Aug. 10, 1944, pp. 156–157. Because of scarci of structural timber and waterfront location naval training station at New York, all buildin are on piles, grade beams are of reinforced co crete, and exterior walls are of concrete block.

Public. U.S. Appraisers Stores Buildin San Francisco, M. Davis. *Architect & Eng* vol. 157, no. 3, June 1944, pp. 21–29. New U. Appraisers Building in San Francisco enjo unique distinction of being only skyscraper world to be erected since Pearl Harbor; 5,500 u treated wood piles were driven to support hu structure which occupies considerable part city block of filled ground; each pipe is from to 60 ft in length; there are 35,000 yd of structu concrete in building, 5,300 tons of structu steel, 5,600 tons of reinforcing steel.

Wind Stresses. Wind Loads on Buildin H. Ferrington. *Structural Engr.*, vol. 22, no. Jan. 1944, pp. 15–40. Recordings of wind spee at meteorological wind stations; application equivalent static pressure; variation of pressu with height; distribution of pressure on buildin wind pressures in various parts of British Isl Concluded from issue of Dec. 1943.

CITY AND REGIONAL PLANNING

Cape Town, South Africa. Cape Tow Foreshore Scheme. *Engineer*, vol. 177, no. 460 Apr. 28, 1944, pp. 334–335. New dock has no been completed, save for graving dock, whi is in course of construction; official plan, put fo ward in 1937, shows new Cape Town would city of wide boulevards and modern buildin with vast new railway station and provision f increased traffic to be expected in future; it h been generally agreed that intrusion of railw lines into heart of city would react detrime tally.



TO 18,310 HARVESTER SERVICE STARS

OUR JOB TODAY

Let's all remember that our job today is to fight harder on the home front . . . fight on the food front . . . give to the blood bank . . . buy extra War Bonds . . . fight inflation . . . for VICTORY.

HARVESTER men-at-war, like all America's fighting men, go where duty calls them. They fight on every front—on land, at sea, and in the air. There are 18,310 of them, and many have already given their lives for their country.

Many of them fight with machines they once helped to build. Take those big International Diesel Crawlers that have advanced with the first waves of attack onto many an invasion shore. Often it's a soldier of Harvester on an International machine. . . . He drives that weapon with confidence and pride. He has reason. He has had a share in the making.

In the jungle scene above are other International machines that fighting men are guiding in the face of enemy fire. Wheel tractors to maneuver the planes—crane tractors to bring them bombs—Diesel units for lighting and power—and those peacetime sluggers that double as secret weapons, the "bulldozers." It takes plenty of this equipment to secure the beachheads, to build the landing strips, to rout the enemy from his defenses.

Firepower, machinepower, and *man*-power make up the might of America's armed forces . . . these things and *the spirit* and *the will*.

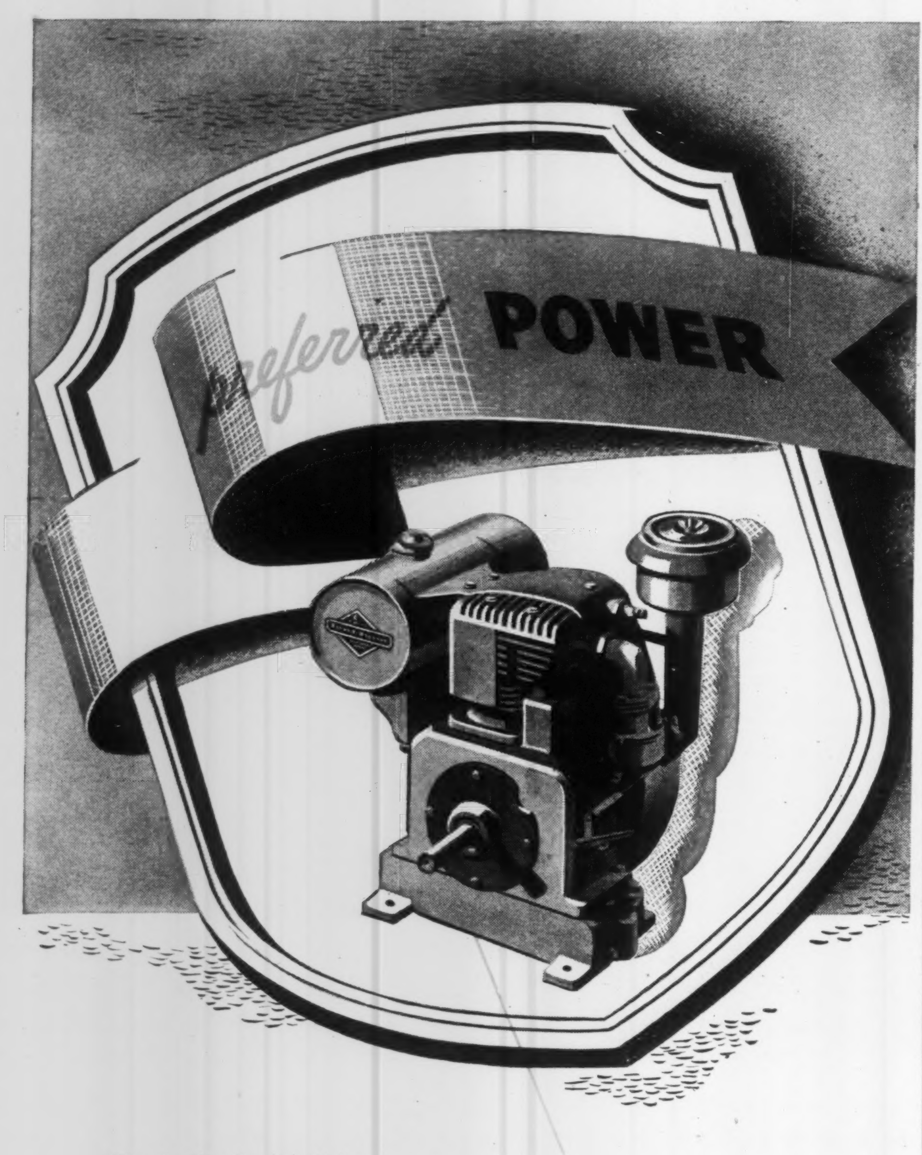
Harvester is proud of its own multiple share in the nation's war effort, but proudest of its fighting men in the armed forces. In the windows of Harvester's home front there are 18,310 service stars to hold us to a DUTY that will not be discharged until the Victory is won.

HARVESTER

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL HARVESTER

Power for Victory . . . Power for Peace



That's the "rating" for
Briggs & Stratton 4-cycle, air-cooled gasoline engines—
leaders in the field . . . Preferred power—
based on the performance record of over 2,000,000
of these engines with their watch-like precision . . .
the result of twenty-five years of continuous production,
plus constant research and refinement.

Air-Cooled Power

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Preferred Power, by manufacturers, by distributors and dealers, by owners and users . . . for hundreds of uses and applications . . . because of *trouble-free performance,* easy starting, and economy of operation. Because of year after year of dependable service with minimum care or attention. We are now ready to help you plan for peacetime production of gasoline powered equipment, tools and appliances. BRIGGS & STRATTON CORP., Milwaukee 1, Wisconsin, U. S. A.

CONCRETE

BARGES. Seagoing Barges Built of Concrete *Construction Methods,* vol 26, no. 8, Aug. 1944, p 55. Brief illustrated note on form work an heavy steel reinforcement at West Coast shipyar by concrete-ship constructors.

BEAMS AND GIRDERS. Simplified Charts fo Double-Reinforced Beams, D. L. Todd. *En News-Rec.,* vol. 132, no. 26, June 29, 1944, pp 948–949. Explanation of charts which autho claims are adapted to suit any code and may b constructed quickly for any strength concret to speed selection of double reinforced concret beams; three charts illustrated.

CONSTRUCTION. How to Determine Amoun of Concrete Needed, E. N. Kemler. *Oil Weekl* vol. 114, no. 9, July 31, 1944, pp. 20–21. Char is presented, with method of use; example of us in solving problem.

CONSTRUCTION, FORMS. Hollow Tile Used fo Forms. *Eng. News-Rec.,* vol. 133, no. 4, July 27 1944, p. 114. Hollow tile filled with concrete a form to construct reinforced concrete core.

ROADS AND STREETS. Elimination of Surfac Scaling of Concrete Pavements by Use of Air Entraining Cement. *Roads & Bridges,* vol. 82 no. 4, Apr. 1944, pp. 57–59, 97–99. Articl prepared by Portland Cement Assn., describe present status of use of air-entraining cement a means of preventing surface scaling, which is on of most troublesome problems in connection wit concrete pavements; what entrained air does construction procedure; design of mix; mixin and placing.

ROADS AND STREETS, REPAIR. Resurfacin Old Texas Concrete. *Better Roads,* vol. 14, no. 6 June 1944, pp. 32 and 34. State highwa department rehabilitated 5.6 miles of 20-year old pavement in Travis County, Tex., by patch ing disintegrated sections and placing ne asphaltic concrete top; manner in which wor was carried out is illustrated and described.

ROOFS, PRE-CAST. Pre-Cast Concrete Roofing *Rock Products,* vol. 47, no. 7, July 1944, p. 84 Illustrated notes on details of roof construction showing how light-weight pre-cast concrete joist rafters, tile and insulating slabs are installed in system developed by British Cast Concret Federation.

STANDARDS. Specifying Controlled Concrete R. F. Moss. *Eng. News-Rec.,* vol. 133, no. 6 Aug. 10, 1944, pp. 152–155. Present-day specifications are responsible for uneconomica and inferior concrete because of lack of incentiv for producer to use accurate control methods specifications assuring improved quality wit greater cost savings are suggested; in them emphasis is variously placed on strength determination, quality bonuses, and profit sharing.

WALLS. Pre-Cast Concrete Walls with Pre stressed Reinforcing Rods Used for Housing *Construction Methods,* vol. 26, no. 8, Aug. 1944 pp. 83–84. Homes for shipyard workers buil with pre-cast vacuum processed concrete wal sections, reinforced with pre-stressed steel rods.

WIND TUNNELS, SEATTLE, WASH. Precise Concrete Curves in Wind Tunnel. *Eng. News-Rec.,* vol. 133, no. 6, Aug. 10, 1944, pp. 174–186 Wind tunnel for high-velocity testing was buil of reinforced concrete to reduce vibration and improve operating conditions; exceptional car was required in building forms for surfaces wit compound curves where accuracy of finish required was without precedent in mass concrete construction; expansion joints and doors are o special design to withstand air pressures as hig as 1,000 lb per sq ft.

CONSTRUCTION INDUSTRY

U.S.NAVY, CONSTRUCTION CORPS. B. Moreell *Constructor,* vol. 26, no. 7, July 1944, pp. 82–84 Brief discussion of construction done by U.S Navy, including drydocks and naval ammunition depots, air stations, etc.

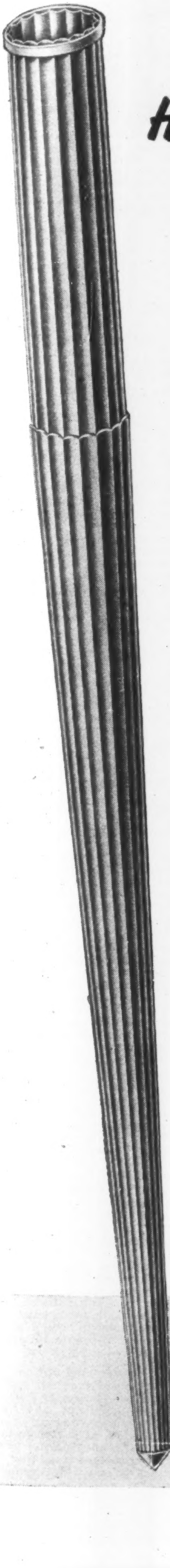
DAMS

EARTH, OHIO. Mosquito Creek Flood Control Dam, A. J. Armstrong. *Eng. News-Rec.,* vol. 133, no. 6, Aug. 10, 1944, pp. 162–165. Shallow earth-fill dam, 1 mile long, and 9,040-acre reservoir of 107,000 acre-ft capacity added to flood control and water supply system in eastern Ohio.

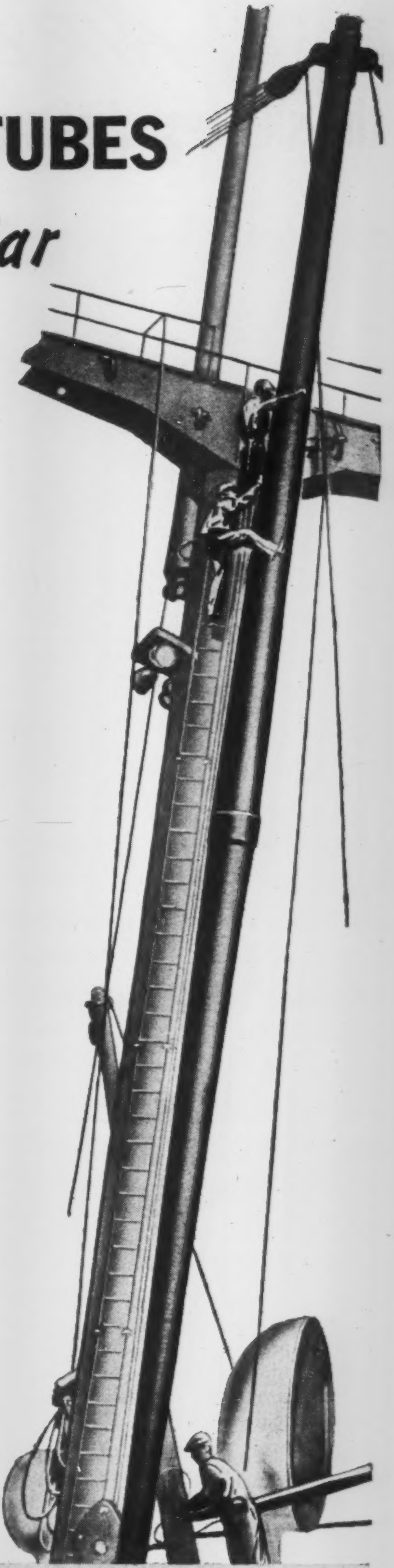
QUEBEC. Manouan and Passe Dangereuse Water Storage Developments. *Eng. J.,* vol. 27, no. 4, Apr. 1944, pp. 200–220. Rock-fill timber-crib dam at Manouan providing storage capacity of 78.5 billion cu ft with 21-ft drawdown, and concrete gravity dam at Passe Dangereuse providing 183 billion cu ft with 110-ft drawdown, insure minimum regulated flow at Shipshaw and Isle Maligne's power plants. Before Eng. Inst. Canada.

RIVERS, DIVERSION. Ogoki Diversion, O. Holden. *Eng. J.,* vol. 27, no. 6, June 1944, pp. 347–352. Discussion of problems of diversion of Ogoki River in Canada, consisting essentially of concrete diversion dam, which raises water level about 40 ft and floods back to height of land.

SPILLWAYS, EROSION. Spillway Erosion at Grand Coulee Dam, K. B. Keener. *Eng. News-Rec.,* vol. 133, no. 2, July 13, 1944, pp. 41–47. Considerable erosion at certain points caused by boulders and gravel drawn back into bucket from river bed and by debris from construction operations; flotating caisson is being built to be used



How We Made MONOTUBES SHIPSHAPE *for War*



LIKE most job-experienced engineers and contractors, you are doubtless familiar with the Monotube tapered pile... know how its lightness, strength, and extendability make cast-in-place piled foundations safer, faster, and cheaper to install. But have you heard the story of how Monotubes went to sea?

When global war stimulated the building of thousands of ships, great numbers of cargo-handling booms were urgently needed. Working to exacting Maritime Commission specifications, Union Metal engineers adapted the Monotube tapered principle to this new use. The result was the Monotube *boom* pictured at right . . . balanced, light weight, strong . . . favored by the Army, Navy, and Merchant Marine alike.

During the last two years these tapered booms have handled millions of tons of munitions, weapons, food, and lend-lease material. And most of Union Metal's production facilities have been given over to their manufacture, *but* . . .

Monotube tapered piles are still obtainable for *essential* building . . . and there'll be unlimited numbers ready for the postwar building boom. When you think of cast-in-place piled foundations—think of Monotubes. Available in gauge, taper, and size to meet all requirements. The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Monotube Tapered Piles

AIR EXPRESS

the shortest distance between two points!

FAR SHORTER BY THE CLOCK—one mile is 20 seconds in the air!

SPECIFY AIR EXPRESS. Get your shipment the fastest way!

NOTE TO SHIPPERS: Ship order when ready, early-day shipping means quicker delivery.

A Money-Saving, High-Speed Tool For Every Business

With additional planes and space available for all urgent cargo, 3-mile-a-minute Air Express directly serves hundreds of U.S. cities and scores of foreign countries. And shippers nationwide are now saving an average of more than 10% on Air Express charges—as a result of increased efficiency developed to meet wartime demands.

WRITE TODAY for "North, East, South, West"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-11, Railway Express Agency, 230 Park Avenue, New York 17, N. Y., or ask for it at any local office.

AIR EXPRESS
AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

to unwater sections of bucket to permit replacement of eroded concrete.

FLOOD CONTROL

KENTUCKY. Work on Flood Protection Structures Nears Completion at Paducah, Ky. *Eng. News-Rec.*, vol. 133, no. 4, July 27, 1944, pp. 97–99. Levees and flood walls to protect city from floods are briefly described; pumping plants to discharge rain water from leveed area.

TENNESSEE. Memphis Prepares for Its Next Flood. *Eng. News-Rec.*, vol. 133, no. 6, Aug. 10, 1944, pp. 166–169. Earth-fill levees and two large pumping stations constructed; sand-filled, steel sheet-pile cells required to support concrete pump house and heavy pumping equipment.

WICHITA, KANS. When Flood Sweeps City, P. L. Brockway. *Roads & Streets*, vol. 87, no. 6, June 1944, pp. 67–68. Notes on Wichita's recent record flood, and how rescue work was organized and damaged pavements are to be repaired.

FOUNDATIONS

DRAINAGE. Ground Dewatering for Construction, R. Nebolsine. *Eng. News-Rec.*, vol. 132, nos. 14 and 16, Apr. 6, 1944, pp. 479–483; Apr. 20, pp. 556–560. Development of concepts and procedures for lowering level of ground water to facilitate subsurface construction has evolved within last century; article tells history and describes projects outstanding in progress of subsurface dewatering; criteria for selection of drainage methods and newly developed process for installing horizontal wells with description of its application to Brooklyn-Battery vehicle tunnel in New York are described.

HYDROELECTRIC POWER PLANTS

QUEBEC. Construction of Shipshaw No. 2 Power Development, W. Griesbach [illegible] vol. 27, no. 4, Apr. 1944, pp. 23 [illegible] liminary work, including rock-cr [illegible] concrete-mixing plants, earth and [illegible] tion, pouring of concrete, steel constr [illegible] are reviewed. Before Eng. Inst. C [illegible]

QUEBEC. Engineering History [illegible] M. DuBose. *Eng. J.*, vol. 27, no. 4 [illegible] pp. 194–199. Development of pro [illegible] lined; since original conception. [illegible] Inst. Canada.

IRRIGATION

INDIA. Indian Irrigation at Outbre [illegible] R. R. Ryves. *Civ. Eng.* (London), v [illegible] 453, Mar. 1944, p. 57. Review of la [illegible] "Triennial Review of Irrigation in [illegible] records situation shortly before outbre [illegible] covering total area irrigated; produc [illegible] and improductive works; area sown and areas irrigated; well irrigation; floods; drought; works completed, in progress, and projected; and mileage of canals.

LAND RECLAMATION AND DRAINAGE

ROADS AND STREETS. Drainage Cures Sliding Fill, J. C. Akers. *Better Roads*, vol. 14, no. 4, Apr. 1944, pp. 23–25. Subterranean water undermined fill on section of belt line route in Davidson County, Tennessee; placing of subdrainage installations remedied trouble; manner in which work was carried out; general layout at site of fill, showing limit of slide and arrangement of drainage installations, given.

ROADS AND STREETS. Review of Some Drainage Practices, F. V. Reagel. *Highway Mag.*, vol. 35, May-June 1944, pp. 90–91. One of most urgent needs in highway field and which will effect millions of dollars saving, if obtained, is some means or method for tailor-making design of highway and airport bases and surfaces to fit existing conditions of subgrade support and drainage; brief discussion of drainage problems.

SWITZERLAND. Die Melioration der Rheinebene, H. Fluck. *Wasser-u Energiewirtschaft*, vol. 36, no. 3, Mar. 1944, pp. 21–30. Improvement of Rhine River territory in Switzerland; natural and economic principles involved; map of Rhine Valley presented; history of project and work carried out; drainage; colonization and roads; land filling; costs and financing.

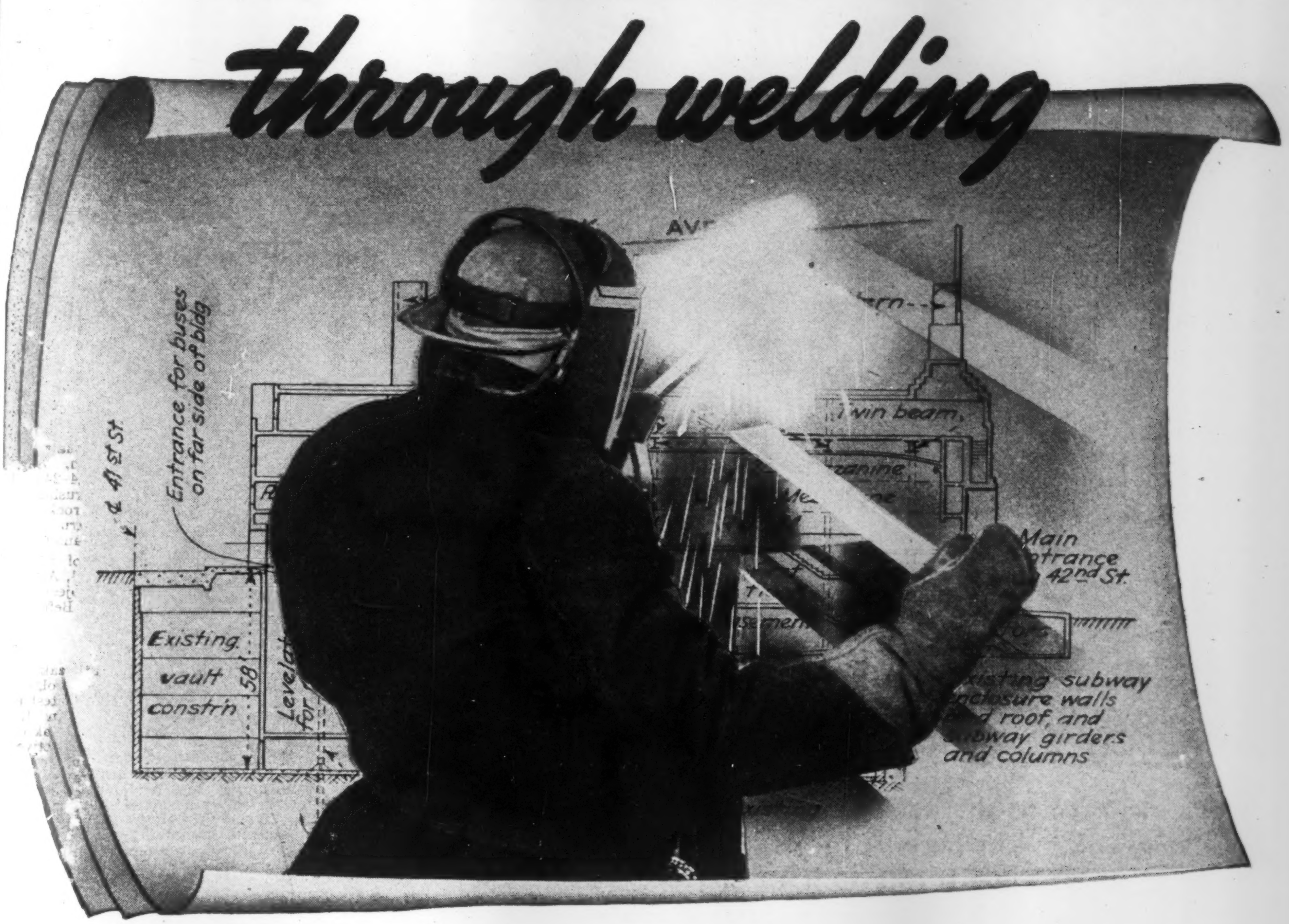
MATERIALS TESTING

CONCRETE. Tests of Concrete Containing Florida "Ojus" Rock. W. E. Grieb. *Pub. Roads*, vol. 23, no. 12, April-May-June 1944, pp. 315–318. Results of investigation made to determine whether aggregate made from Florida coral formation known as "Ojus" rock is as satisfactory as natural sand and trap rock for use in reinforced concrete exposed to action of sea water; because of porous nature, ability of rock to protect embedded reinforcing steel against corrosion has been questioned; tests made by subjecting concrete specimens in which plain steel rods were embedded to alternate immersions in synthetic sea water followed by drying in air.

ROADS AND STREETS. Laboratory Builds Profilograph to Measure Pavement Roughness, F. N. Hveem. *Calif. Highways & Pub. Works*, vol. 22, nos. 3 and 4, Mar.-Apr. 1944, pp. 6–9. Machine described in which 16 small pneumatic-tired wheels are provided, each free to move independently in vertical plane; carrier wheels are fixed in staggered arrangement so that no two wheels will strike transverse ridge or inequality at same time; apparatus may be dismantled into

BETTER STRUCTURAL DESIGN

through welding


Entrance for buses on far side of bldg
℄ 41st St
Existing vault constr'n
58'
Main entrance 42nd St
Existing subway enclosure walls and roof, and subway girders and columns
twin beam
AVE

ALTHOUGH welding has made amazing progress as a structural fabrication method, full advantage is not always taken of the special adaptability of welding to the most modern types of construction. Also, details of design as used in practice, often have not provided for the most efficient use of welding.

For example, in some buildings it is desirable to develop continuity of beams, columns and girders, not only to save steel material, but also to reduce depth of framing and thereby to facilitate the provision of smooth modern interior surfaces. Here all-welded design facilitates this objective to an unusual degree.

There are many other practical features of welding as a structural method that merit full consideration... its demonstrated savings in steel...its quietness on erection work...its more efficient application due to the great increase in the number of trained welders and foremen who are becoming available for welding as war production decreases.

Representatives of Airco's Applied Engineering Division have acquired extensive experience in the application of welding to many types of war and peacetime structures. Architects, engineers and designers are invited to make use of their experience in working out problems of structural design.

Write to Dept. **CE**, at the New York address.

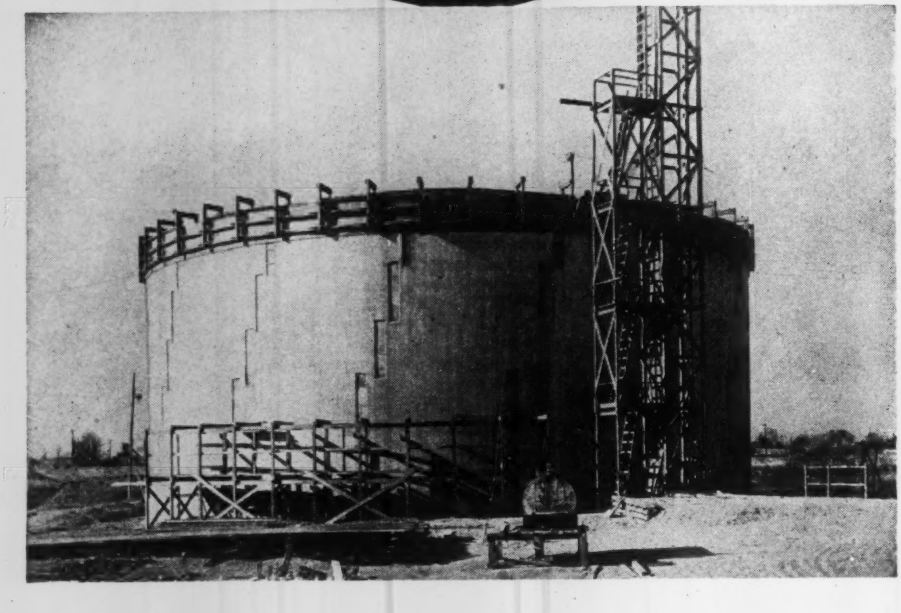
★ BUY UNITED STATES WAR BONDS ★

AIRCO

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.
In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS
Offices in all Principal Cities

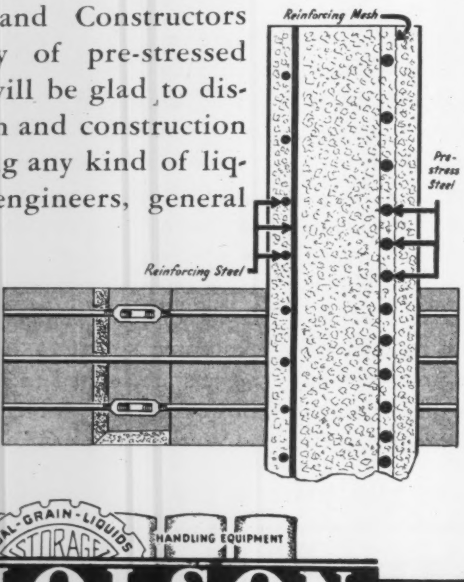
PRE-STRESSED CONCRETE
It Makes Stronger Tanks



The net force on the walls of a concrete tank full of liquid is "outward." The purpose of "pre-stressing" the concrete during construction is to give it a permanent compression to help withstand the future outward pressure.

Nicholson Engineers and Constructors have made a specialty of pre-stressed concrete tanks. They will be glad to discuss plans for the design and construction of such tanks for storing any kind of liquids with consulting engineers, general contractors or owners.

Photograph shows a Pre-Stressed Concrete Tank recently constructed by Nicholson. The drawing gives some of the details. The construction was also by the Sliding Form Method.



BULK STORAGE
COAL-GRAIN-LIQUIDS
STORAGE
HANDLING EQUIPMENT
THE NICHOLSON CO.
CONSTRUCTION
CEMENT-OIL-CHEMICALS
10-NC-2
Ten Rockefeller Plaza New York 20, N. Y.

units not over 40 in. in length and entire assembly stowed in trunk and tonneau of small sedan.

STEEL FATIGUE. Fatigue Factor in Structural Design, W. M. Wilson. *Western Soc. Engrs.—J.*, vol. 49, no. 2, pt. I, June 1944, pp. 51–60. Discussion of fatigue failure, factors affecting fatigue strength of structural members, members of steel bridge most likely to fail in fatigue, and adequacy of present specifications governing design of steel railway bridges. Before joint meeting with Am. Soc. C.E.

MUNICIPAL ENGINEERING

UNDERGROUND CONSTRUCTION. Some Geographic Factors in Development of Utility Substructures in New York City and Plan for Directing Subsurface Expansion, J. F. Krakauer. *Mun. Engrs.—J.*, vol. 30, first Quarterly Issue 1944, pp. 28–44. General arrangement of substructures; geographic factors causing particular local congestion; subsurface trunk lines, whether electric power feeders, telephone cables, or sewers, tend to favor for their lanes major traffic arteries underground transportation lines; peculiarities of land utilization in New York; practicability of subsurface zoning.

PORTS AND MARITIME STRUCTURES

PORT STRUCTURES. Outfitting Wharf on Sloping Rock, W. P. Ehrman. *Eng. News-Rec.*, vol. 132, no. 24, June 15, 1944, pp. 888–889. Rigid support for gantry crane runway and platform deck over sloping limestone bedrock on inland river obtained by settling steel caissons in fresh concrete placed on river bottom by tremie; caissons were filled with concrete and supported laterally by rock-filled timber cribs to carry 70-ton wheel load on crane girders.

RETAINING WALLS. Penetration of Sheet Pile Retaining Walls, F. L. Kassel. *Civ. Eng.* (London), vol. 39, no. 455, May 1944, pp. 108–111. Relations between penetration of sheet piles and properties of cohesive and non-cohesive soils on one hand, and application of tie rods and anchorages, and forces developed in these on other hand, investigated.

SHORE PROTECTION. Coastal Protection, C. E. Fellows. *Civ. Eng.* (London), vol. 39, no. 455, May 1944, pp. 100–104. Consideration of theories of tides and various features of tidal movement as they affect necessity and design of shore-protection structures; types of coast defense depending upon physical structure of area; designs of seawalls illustrated and discussed; generalizations on layout of coast defense schemes.

ROADS AND STREETS

AIRPORT RUNWAYS. Runway Extensions a Mucking Job. *Roads & Streets*, vol. 87, no. 5, May 1944, pp. 55–60. Extension of three runways at Warner Robins Air Depot near Macon, Ga., to meet new requirements for heavy bombers, necessitated removing about 230,000 cu yd of swamp mud and backfilling with suitable material; job involved approximately 1,250,000 cu yd of unclassified excavation, with approximately 1,000,000, $^{1}/_{2}$ mile-yd of overhaul, plus 450 acres of messy clearing and grubbing and over 500 acres of timber clearance for glide angle; manner in which work was accomplished.

AIRPORT RUNWAYS, CORAL. Coral Airstrips on Pacific Islands, N. A. Bowers. *Eng. News-Rec.*, vol. 133, no. 2, July 13, 1944, pp. 26–34. Methods of handling coral, desirable conditions for working with it and results accomplished are discussed; Characteristics of Coral Deposits, H. T. Stearns.

ASPHALT. Emulsified asphalt and Sand for Road Paving, C. L. McKesson. *Roads & Bridges*, vol. 82, no. 4, Apr. 1944, pp. 50–53, 107–110. Article deals with gradation, stability, construction procedure, and compaction. Before Assn. Asphalt Paving Technologists.

DENMARK. Die Rodby—Fehmarn-Linie, H. Flensborg. *Organ fuer die Fortschritte des Eisenbahnwesens*, vol. 97, no. 8, Apr. 15, 1942, pp. 120–122. Contribution to history of Rodby-Fehmarn project for construction of railway and highway over Fehmarn Belt, connecting Denmark with German mainland; work was begun in Sept. 14, 1941, on line which has been contemplated and discussed for past 80 years.

DESIGN. New Design Policies for Arkansas Roads. *Eng. News-Rec.*, vol. 133, no. 2, July 13, 1944, pp. 48–51. New policies adopted by Arkansas State Highway Commission; major changes affect width of roadway and right-of-way, subgrade stabilization and pavement design, highway classification and alinement, bridge and shoulder widths, limiting grades, and curvature.

EXPRESSWAYS AND PARKWAYS, PITTSBURGH, PA. Pittsburgh's Penn-Lincoln Parkway. *Roads & Streets*, vol. 87, no. 6, June 1944, pp. 62–66. Surveys and construction plans being pushed by consulting form in $20,000,000, 9.3-mile expressway, designed to eliminate bottleneck in Pittsburgh's traffic congestion and join regional network of boulevards and roadways in that area; heavy traffic volume; complex interchange design; "visible" design of bridge railings; tunnel features; property damage as route factor.

FLIGHT STRIPS. Alaska Highway Flight Strips. *Roads & Streets*, vol. 87, no. 6, June 1944, pp. 79 and 81; see also *Roads & Bridges*, vol. 82

Davison Limited Highway is helping Detroit avert traffic chaos. Many cities need similar direct routes through built-up areas.

Urban Expressways Call for CONCRETE

Many cities are now making comprehensive plans for redesigning their street systems to include expressways which will reduce accidents and handle traffic in congested areas at minimum cost.

Urban expressways and heavily traveled streets to carry, economically, the increased volume of postwar traffic, must be built of a long-lived material. Concrete has the strength and stamina to carry the heaviest traffic safely at low annual cost.

Concrete construction conserves motor tax money. Not only is the first cost of concrete pavement less than for other pavement of equal load-carrying capacity, but the annual surface maintenance cost is less.

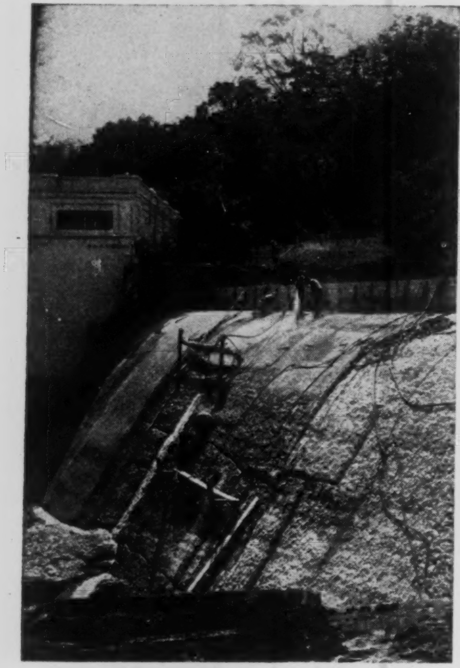
Our engineers will gladly help you work out the most economical concrete pavement designs for your postwar program.

PORTLAND CEMENT ASSOCIATION
Dept. 11-13, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

★ BUY MORE WAR BONDS ★

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



A DAM SAVED WITH "GUNITE"

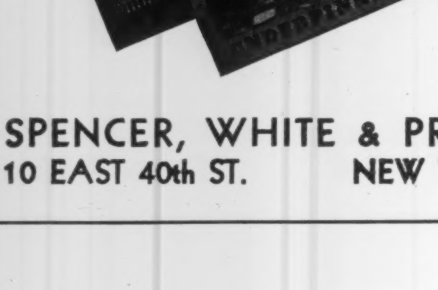
The photograph to the left shows various stages of the work of re-integrating with "GUNITE" the downstream face of a badly eroded concrete dam of the Central Hudson Gas and Electric Company, in central New York, near Poughkeepsie. Note cleaned and chipped portion, in the foreground, shooting the "GUNITE" at top middle and a finished section on the left. Drainage channels were provided behind the "GUNITE" to take care of seepage. This work was done by us in 1942.

Our Bulletin Number 2200 describes similar jobs and many other uses of "GUNITE." Write today for a copy.

MANUFACTURERS OF THE "CEMENT GUN"

FOUNDATIONS

PRETEST UNDERPINNING
CONCRETE-STEEL PILES
MASS CONCRETE CONSTRUCTION
HEAVY SHORING
DRILLED-IN CAISSONS



Send for catalogs descriptive of the latest foundation types and methods.

SPENCER, WHITE & PRENTIS, INC.
10 EAST 40th ST. NEW YORK 16, N. Y.

no. 5, May 1944, pp. 41–43, 81–84. Some construction details with reference to eight flight strips, or auxiliary airports, located at strategic points in wilderness of Northwest Canada and Alaska, now in active operation along 2,000-mile vital airway between Edmonton, Alberta, and Fairbanks, Alaska.

HIGHWAY ADMINISTRATION, MICHIGAN. Record of Roads and Bridges. We Use It Every Day! J. T. Sharpensteen. *Better Roads*, vol. 14, no. 4, Apr. 1944, pp. 26–28. Delta County, Michigan, has complete inventory of its roads and drainage structures; bridge records make possible structural analysis of old spans and facilitate emergency repairs; new uses are continually being found for road-inventory information.

HIGHWAY SYSTEMS, ALASKA. Glenn Highway to Be Important Link Across Southern Alaska, W. H. Spinler. *Highway Mag.*, vol. 35, Apr. 1944, pp. 52–56. Constructional details pertaining to new highway of military importance; drainage; surfacing; maintenance; map of Glenn Highway and connections in southern Alaska, given.

HIGHWAY SYSTEMS, FLORIDA. Overseas Highway Shortened by 17 Miles. *Eng. News-Rec.*, vol. 132, no. 24, June 15, 1944, pp. 882–887. Overseas Highway shortened by reconstruction of 91 miles of abandoned railway as paved highway; ties and rails of old bridges were replaced with concrete deck overhanging 6 to 7 ft each side and providing 22-ft clear roadway; four new bridges, including one bascule, were built; between bridges 8-in. two-course bituminous-surface treated pavement 22 ft wide was put down.

HIGHWAY SYSTEMS, UNITED STATES. Highway Program—Present and Future, T. H. MacDonald. *Constructor*, vol. 26, no. 7, July 1944, pp. 89–92. Discussion of highway construction plans proposed by states and construction now under way.

MAINTENANCE AND REPAIR. Maintenance of Alaska Highway, H. S. Flint. *Highway Mag.*, vol. 35, May-June 1944, pp. 76–80. Brief commentary on methods and equipment used in winter maintenance of Alaska highway; ice and snow removal; sanding; keeping culverts open; other maintenance features.

MAINTENANCE AND REPAIR. Patching and Widening Methods on 23-Mile Georgia Project, G. T. McDonald. *Roads & Streets*, vol. 87, no. 4, Apr. 1944, pp. 55–58. Use of soil cement as base material for shoulders and patching is feature of 23-mile $454,000 widen-repair-resurface project on U.S. 29 southeast of Atlanta; illustrated description of methods and equipment used.

MAINTENANCE AND REPAIR. Preserving Old High-Type Flexible Pavements Awaiting Deferred Construction. *Roads & Streets*, vol. 87, nos. 4 and 5; Apr. 1944, pp. 70–72; May, pp. 69–70. April Temporary maintenance, repairs, and resurfacing methods are discussed. May: Procedure for widening pavements outlined. From subcommittee report, "Salvaging Old High-Type Flexible Pavements," submitted at Highway Research Board Meeting.

MAINTENANCE AND REPAIR. Soil-Cement Used for Roadway Maintenance, L. E. Akers. *Eng. News-Rec.*, vol. 132, no. 26, June 29, 1944, pp. 942–943. In patching secondary roads with soil cement, Virginia Dept. of Highways removes broken pavement plus any underlying unstable soil and fills excavation with about 10-in. thickness of soil-cement placed over crushed stone; soil-cement mix is compacted in place in roughly 4-in. layers with pneumatic tampers and last layer is covered with 1-in. sand-asphalt wearing surface; patched areas are opened immediately to traffic.

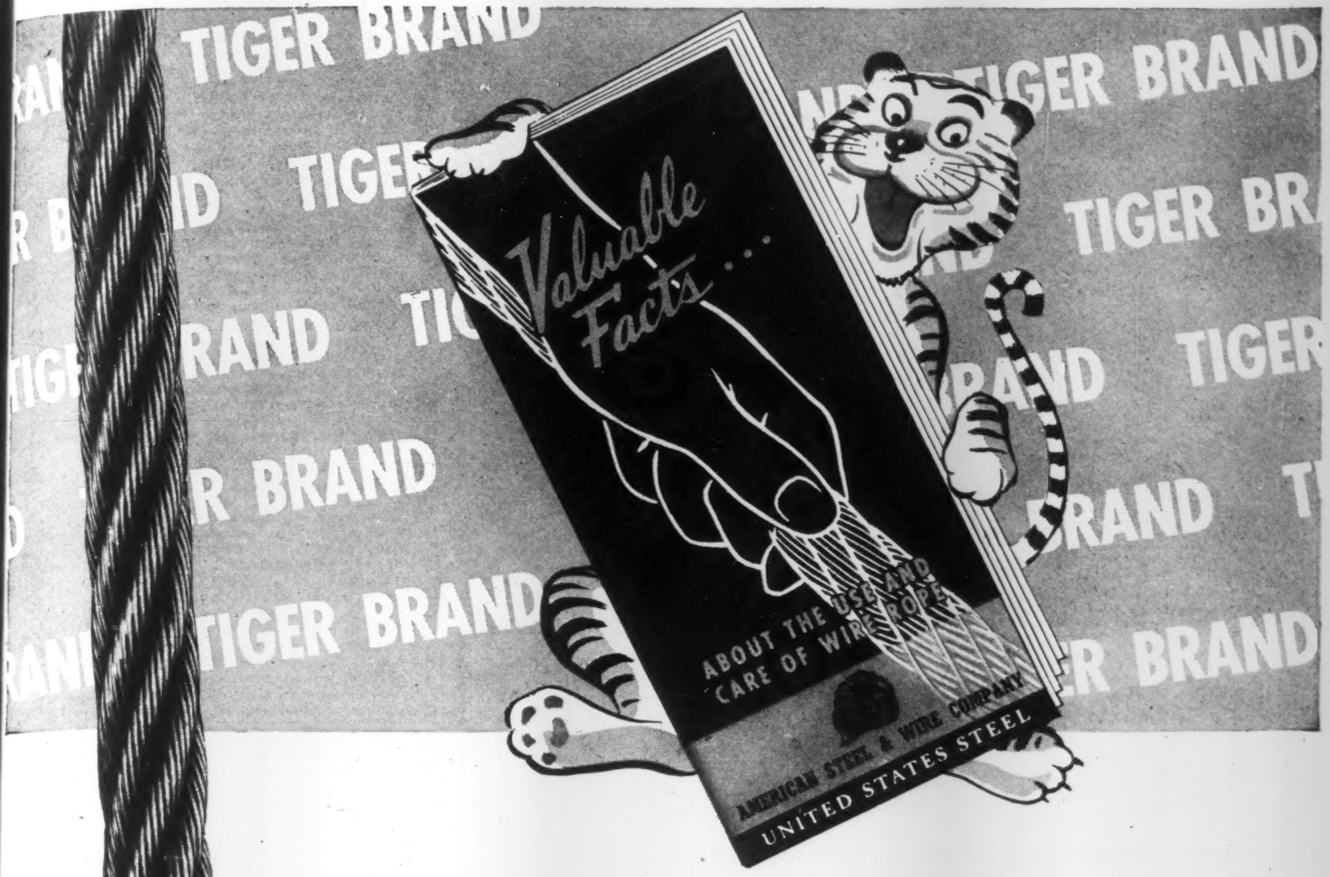
MILITARY ENGINEERING, ROAD CONSTRUCTION. Construction in Tundra, H. W. Richardson. *Eng. News-Rec.*, vol. 132, no. 26, June 29, 1944, pp. 956–961. Discussion of problems and techniques used by Army engineers; tundra either removed or covered up with stable material in building roads and airports.

SNOW AND ICE CONTROL. Major Highways Blocked by Heavy February and March Snowfalls, M. A. O'Brien. *Calif. Highways & Pub. Works*, vol. 22, nos. 3 and 4, Mar.-Apr. 1944, pp. 3–5 and 18. Snow-clearing procedure used by California Division of Highways is described; note on equipment employed.

SOILS, EROSION. Vegetation for Erosion Control in Intermountain Zone of Northwest, A. L. Hafenrichter. *Better Roads*, vol. 14, no. 5, May 1944, pp. 15–16 and 27. Vegetative control is practiced successfully under adverse conditions characterizing this region where annual rainfall is not less than 10 in.; planting must be done at right time, care and skill in execution are prime essentials, and maintenance is indispensable.

SOILS, STABILIZATION. Improved Soil Stabilization, G. Piette. *Eng. J.*, vol. 27, no. 7, July 1944, pp. 413–416. Research bureau of Quebec Highways Dept. has tried to obtain conclusive results on subject of improved soil stabilization, defined as process of supplying granular soil with such cohesive materials as will develop maximum efficiency under all circumstances. Before Eng. Inst. Canada.

SOILS, STABILIZATION. Stabilization of Soils, H. E. Brooke-Bradley. *Surveyor*, vol. 103, nos. 2723, 2724, and 2725. Mar. 31, 1944, pp. 147–


TIGER BRAND
Valuable Facts...
ABOUT THE USE AND CARE OF WIRE ROPE
AMERICAN STEEL & WIRE COMPANY
UNITED STATES STEEL

Excellay Preformed
AMERICAN TIGER BRAND WIRE ROPE
AMERICAN STEEL & WIRE COMPANY

The "Facts of Life" for wire rope users . . .

EVEN when you start with a good wire rope—such as American Tiger Brand—treat it right if you want it to give all the life that is built into it.

In this handy 48-page booklet are the things every wire rope user should know about proper rope handling and care.

The easy-to-follow instructions and the practical suggestions it offers are based on the experience of thousands of rope users. They will help you avoid the common errors that shorten rope life and reduce operating efficiency.

Subjects covered include — correct handling of ropes, how and when to lubricate, attaching of clips and sockets, splicing, care of sheaves and drums, minimum safety factors and many other helpful hints that will show you how to keep your wire rope operating at maximum efficiency and for the longest possible time.

Right now, with seasoned operators few and far between, this handy guide to better rope performance is doubly valuable. This booklet is free. Send for as many copies as you need and get them into the hands of the right men.

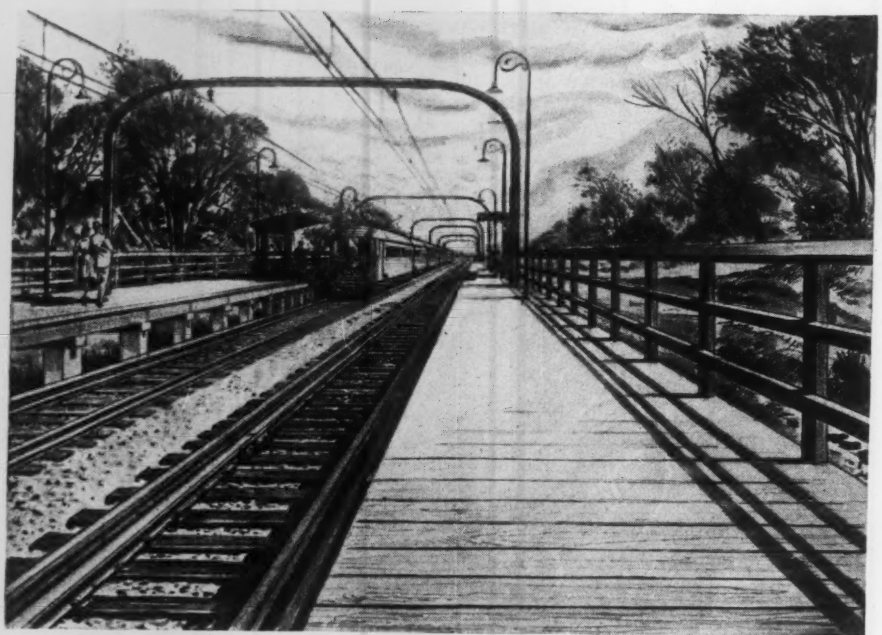
Send for FREE WALL CHART, too

The ten vital rules of wire rope care and handling are graphically illustrated and briefly described in this attractive wall chart. Printed in colors, on a 15″ x 21″ heavy cardboard mount, it can be placed for ready reference wherever wire rope is being used. Acts as a constant reminder of good wire rope operating use and practice.

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
San Francisco
United States Steel Export Company, New York

USS

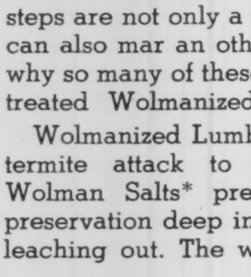
UNITED STATES STEEL



Treated wood helps keep overhead down, good-will up

Station platforms on interurban railways are the places where patrons form their first impressions of the lines' service and efficiency. Decayed platform decks or broken steps are not only a source of expense to the railway—they can also mar an otherwise favorable public opinion. That's why so many of these "front porches" are built of pressure-treated Wolmanized Lumber*.

Wolmanized Lumber owes its ability to resist decay and termite attack to vacuum-pressure impregnation with Wolman Salts* preservative. This treatment drives the preservation deep into the wood; fibre-fixation prevents its leaching out. The wood is clean, odorless and paintable.



You can't get these results by painting a preservative on or dipping the wood. Decay and termites find it too easy to get inside a film so loosely applied.

Wolmanized Lumber has been employed all over the world by our armed forces, as a means of effectively combatting decay and termite attack. Be guided by the choice of engineers who have selected this wood after observing the splendid performance of millions of feet of Wolmanized Lumber in the toughest kind of assignments. American Lumber & Treating Company, 1654 McCormick Building, Chicago 4, Illinois.

*Registered trademarks

WOOD THAT'S *Alloyed* FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

150; Apr. 7, pp. 163–164; Apr. 14, pp. 171–174. Importance of soil stabilization in structural design of roads; considerations in building new highway; roadbed, drainage methods, clay subsoils, plasticity and shrinkage, soil mixes, testing procedures, stabilization methods; classification of soils in United States; operation and materials used in stabilizing soils; report on American investigations. Bibliography. Before Instn. Structural Engrs.

TEXAS. Good Roads for Citizens at Forks of Creek, C. Morris. *Better Roads*, vol. 14, no. 6, June 1944, pp. 23–24. Concise presentation of local road problem facing state of Texas; emphasis placed on modern day methods in administration of county highway affairs; rapid extension of all weather surfacing on local roads at end of war is essential to economic good health of farm communities and state as whole.

TRINIDAD. Jungle Roadbuilding in Trinidad, L. Miscall. *Eng. News-Rec.*, vol. 133, no. 6, Aug. 10, 1944, pp. 146–149. Navy Seabees built road through mountainous jungles using bulldozers, shovels, dynamite, and native labor; no fills in road, every foot of $7^1/_2$-mile length being in side-hill cut where spoil, including largest trees, was shoved over edge to seek own waste bank.

VIRGINIA. Design Begins with Subgrade, T. F. Loughborough. *Better Roads*, vol. 14, no. 5, May 1944, pp. 25–27. Virginia Department of Highways evaluates subgrades with care before starting design; admixture and mat treatments used successfully under variety of conditions; district soils engineers, mainsprings of corrective subgrade work. Abstract of paper before Southeastern Assn. State Highway Officials.

SANITARY ENGINEERING

LATIN AMERICA. Sanitary Engineering in Latin America, H. B. Gotess. *Am. J. Pub. Health*, vol. 34, no. 6, June 1944, pp. 598–604. Cooperative health and sanitation programs are under way in 18 Latin-American republics; work includes construction and operation of hospitals and dispensaries, development and rehabilitation of water supplies, construction and extension of sewerage systems, malaria control through drainage, larvacidal operations, education of medical, engineering, and nursing personnel, and education of public in health.

SEWERAGE AND SEWAGE DISPOSAL

GAS RECOVERY. Unique Method of Gas Collection and Utilization, J. P. Burden. *Sewage Works J.*, vol. 16, no. 4, July 1944, pp. 801–805. Description of system at San Angelo (Tex.) plant in which gas vents of Imhoff tanks are covered over, and gas is collected and conserved as fuel.

GREASE REMOVAL. War Experience with Grease Interceptors, A. H. Dreher. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 7, July 1944, pp. 340, 359–360. Discussion of general problem of grease recovery.

GRIT REMOVAL. It Takes Grit to Battle Grit at Buffalo Sewage Plant, J. W. Johnson. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 8, Aug. 1944, pp. 386–387, 412–413. Description of operating conditions and maintenance problems arising from presence of inorganic solids in mineral matter.

INDUSTRIAL WASTES. Evaporating Ponds for Waste Water Spread Over 1,800 Acres. *Eng. News-Rec.*, vol. 132, no. 18, May 4, 1944, p. 683. To avoid polluting sources of water supply waste, water highly charged with sodium chloride is discharged from Western industrial plant into 338 shallow ponds formed by making dikes; water is then evaporated or percolated, leaving salts at or near surface.

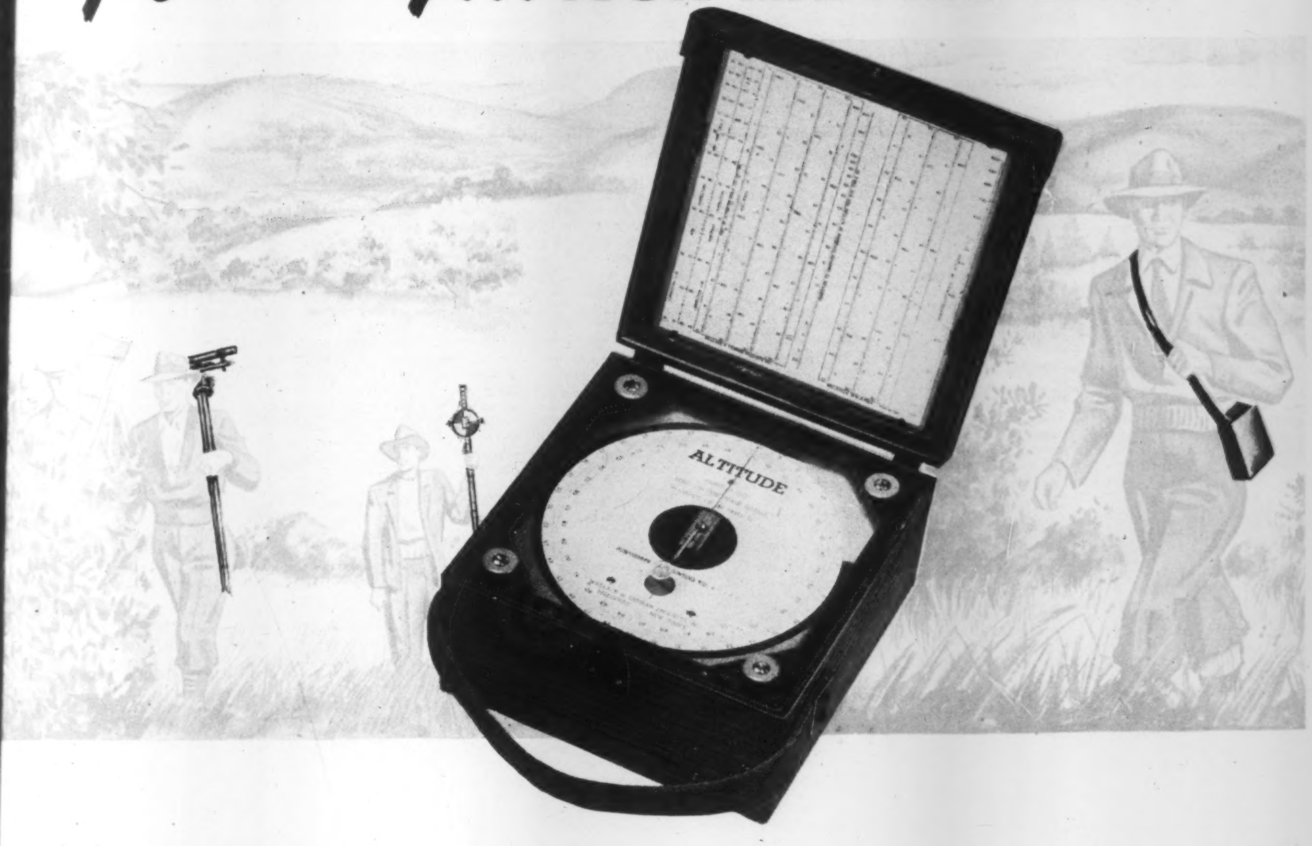
ORDNANCE PLANTS. Sewage Pumps and Lag Tanks Speed Ordnance Plant Work, H. L. Kaufman. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 6, June 1944, pp. 285–287. Description of sewerage system at munitions project, where pumping stations were used at each production center in place of gravity sewers, and lag tanks to store sewage delivered at peak periods.

POSTWAR PLANNING. Postwar and Advance Planning—Symposium. *Sewage Works J.*, vol. 16, no. 4, July 1944, pp. 671–686. Symposium includes following papers: Blueprint Now! Who Starts It? E. L. Filby; Selling Postwar Planning to Local Taxpayer and Governing Body, F. D. Livermore; Effect of Industrial Waste on Trend of Sewage Treatment, C. W. Paulus; Consulting Engineer in Advanced Planning, E. T. Killam.

SEWAGE ANALYSIS. How One Plant Samples Sewage and Sludge. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 8, Aug. 1944, pp. 417–418. List of treatment units and methods of sampling and analysis given; excerpt from annual report of Hartford (Conn.) treatment plant.

SEWAGE TANKS. Foaming and Sludge Removal in Floating Cover Digesters. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 5, June 1944, pp. 289 and 310. Summary of opinions of contributors to round-table discussion indicate that formation of scum is not serious problem; when difficulties do occur, operation techniques can be evolved to correct them; little effect on gas production results from scum-correction procedures.

To lighten ... YOUR MAPPING LOAD



The Problem — To map 5- or 10-foot contours conveniently, quickly and economically.

The Solution — The Two-Base Method of Precise Altimetry, using W&T Sensitive Altimeters, eliminating the time and expense of clearing lines of sight and setting up instruments as required in spirit leveling.

The Instrument — Temperature compensated W&T Sensitive Altimeters — accurate to one part in one thousand — are available in ranges of 0 to 7,000 feet and 0 to 16,000 feet.

Write for Illustrated Technical Bulletins

A-33

WALLACE & TIERNAN
PRODUCTS, INC.

BELLEVILLE 9 **NEW JERSEY**

CURRENT PERIODICAL LITERATURE

Abstracts of Articles on Civil Engineering Subjects from Publications (Except Those of the American Society of Civil Engineers) in this Country and Foreign Lands

Selected items for the current Civil Engineering Group of the Engineering Index Service, 29 West 39th Street, New York, N.Y. Every article indexed is on file in The Engineering Societies Library, one of the leading technical libraries of the world. Some 2,000 technical publications from 40 countries in 20 languages are received by the Library and are read, abstracted, and indexed by trained engineers. With the information given in the items which follow, you may obtain the article from your own file, from your local library, or direct from the publisher, or they may be borrowed from the Engineering Societies' Library. Photoprints will be supplied by this library at the cost of reproduction, 25 cents per page to members of the Founder Societies (30 cents to all others), plus postage, or technical translations of the complete text may be obtained at cost.

BRIDGES

CAST IRON. Strength of Cast Iron Girder Bridges, C. S. Chettoe, N. Davey, and G. R. Mitchell. *Roads & Road Construction*, vol. 22, no. 259, July 1944, pp. 201–203. Description of investigation made to study behavior, under various conditions of loading, of bridges of cast-iron girder and jack-arch construction; empirical formula evolved, by application of which load-carrying capacity of existing bridges of this type may be assessed; estimation of dead and live load stress; factor of safety. Introduction, summary, and conclusions of paper before Instn. Civ. Engrs.

CONSTRUCTION. Heavy Girders Set Without Crane. *Roads & Streets*, vol. 87, no. 7, July 1944, pp. 61–65. Handling heavy $212\frac{1}{2}$-ft plate girders with unloading frame and dollies, and dewatering boiling cofferdams by draining into end sumps, were features of $930,000 Ohio bridge job on U.S. 50; detailed description of project.

MILITARY. Capua Bridge, A. C. Kraft. *Military Engr.*, vol. 36, no. 227, Sept. 1944, pp. 293–295. Description of construction of 375-ft bridge over Volturno River.

MILITARY. Military and Emergency Bridging Systems. *Engineering*, vol. 158, no. 4096, July 14, 1944, pp. 31–32. Editorial review of history of military bridging in steel spans which dates from last war, or period immediately preceding it: Three inventors came into field with very different types of bridges, each of which had some influence on future design: Inglis bridge, Martel box girder bridge and Hopkins bridge. Callender-Hamilton unit construction bridge also described.

MOVING. Moving a Bridge 100 Miles, D. M. Gowdey. *Military Engr.*, vol. 36, no. 225, July 1944, pp. 236–237. Illustrated description of method used in moving 210-ft bridge; bridge was floated 75 miles downstream, disassembled, carried to camp, and reerected.

PONTOON. Pontoon Cells Used for Girder Bridges, N. A. Bowers. *Eng. News-Rec.*, vol. 133, on. 14, Oct. 5, 1944, pp. 404–408. Bridges built with Navy's 5 by 5 by 7-ft steel pontoon cells by two methods: by floating strings of cells to site where they are hoisted to place to form 75-ft span, and by delivering strings of cells for 81-ft span on trailers to approach trestle and then thrusting them out across unbridged span as cantilever.

RAILROAD, MAINTENANCE AND REPAIR. Gangs Set Enviable Record in Rebuilding Long Burned-Out Bridge. *Ry. Eng. & Maintenance*, vol. 40, on. 9, Sept. 1944, pp. 805–807. Description of manner in which massed bridge gangs on Missouri Pacific Lines in Texas and Louisiana, employing highly effective methods and equipment, rebuilt 72 panels of 142-panel treated-pile bridge, adequate for train movements, in 150 hours, completing work later under traffic; how tractor bulldozer was used most effectively in clearing away debris and for transporting materials for rebuilding operations.

RAILROAD, PORTABLE. Portable Railway Bridges Precision Built, R. J. Wood. *Eng. News Rec.*, vol. 138, no. 16, Oct. 19, 1944, pp. 477–480. British Army Engineers develop portable sectional, bolt-and-pin-connected bridge, easily adapted to spans from 15 to 85 ft, to narrow or standard gage track, and to deck or through type construction; known as unit construction railway bridge and not to be confused with Bailey Bridge for highway traffic.

STEEL, DEMOLITION. Dynamiting Does Trick in Dismantling Old Bridge, G. A. Belden. *Ry. Eng. & Maintenance*, vol. 40, no. 8, Aug. 1944, pp. 711–712. Author explains manner in which Central Railroad of Georgia, dismantled two-span deck-truss bridge; about 300 tons of steel, which will be used in making repairs to bridges and other facilities, salvaged.

STEEL, DEMOLITION. Removing Bridge from Mississippi. *Eng. News-Rec.*, vol. 133, no. 14, Oct. 5, 1944, pp. 429–434. Heavy marine blasting removed 500 tons of wreckage of bridge at Chester, Ill., to provide 300-ft clear navigation channel; salvage operations were completed in 15 days and without mishap, despite unusual hazards; reason for failure of bridge in high wind still unexplained.

STEEL, PROTECTIVE COATINGS. Galvanized, Bridge Rail Tried in Minnesota. *Eng. News-Rec.*, vol. 133, no. 12, Sept. 21, 1944, p. 374. Hot dip galvanizing found to be effective protection for bridge railings against weathering.

STEEL, STRENGTHENING. Southern Pacific Makes Bridge Earthquake-Resistant. *Ry. Age*, vol. 117, no. 6, Aug. 5, 1944, pp. 232–233 and 238. Incorporation of protection against earthquake damage and installation of equipment to detect displacement of spans as result of seismic disturbance, and to stop trains if this occurs, were features of design of structure which Southern Pacific erected recently to replace older steel bridge, near Watsonville Junction, Calif.; detailed description of bridge, and manner in which work was accomplished.

STEEL TRUSS, ST. LAWRENCE RIVER. Great Bridges of St. Lawrence, J. G. Pierson. *Civ. Eng.* (London), vol. 39, no. 458, Aug. 1944, pp. 177–179. Description of Quebec Bridge, largest cantilever bridge in world, and Montreal Harbor Bridge.

SUSPENSION, VIBRATION. Vertical Vibration Studies on Golden Gate Bridge. *Eng. News-Rec.*, vol. 133, no. 12, Sept. 21, 1944, p. 373. Instrument developed and tried out on Golden Gate Bridge for making record of vertical vibrations in structure caused by winds.

WOODEN, COVERED. Covered Bridge, J. F. Donahue. *Highway Mag.*, vol. 35, July–August 1944, pp. 104–106. Covered bridges, in general, represent old American landmarks; they are not, however, American invention and can be found in all forested countries from Norway to China; brief commentary on several wooden covered bridges; including Spoon River Bridge in Illinois which has been in service over 100 years, Little Mary's River Bridge, and Henderson Creek Bridge. From Illinois Pub. Works, date not specified.

WOODEN, STRENGTHENING. Building New Piers Under Old Wooden-Truss Covered Bridge, G. H. Elbin. *Pub. Works*, vol. 75, no. 7, July 1944, pp. 11–12. Details pertaining to strengthening of Morse Road Bridge in Franklin County, Ohio, which was done by constructing piers for proposed new bridge deferred due to scarcity of steel, and using them to support old bridge; each pier is 36 ft long and 2 ft 6 in. thick, resting on foundation 38 ft by 6 ft by 2 ft thick.

CITY AND REGIONAL PLANNING

CITIES, AIR TRANSPORT. Will Cities Come of Air Age? A. Mayer. *Am. City*, vol. 59, nos. 8 and 9, August 1944, pp. 51–52, September, pp. 78–81. Problems demanding prompt consideration by all air-important cities, both on their own account, and as parts of nation's air-transport system.

GREAT BRITAIN. Bristol City Planning and Reconstruction. *Surveyor*, vol. 103, no. 2729, May 12, 1944, p. 229. Report by H. Marston, city engineer and chief planning officer, for planning and reconstruction of central area of Bristol includes proposals for redevelopment after war of area of 774 acres, which has been badly damaged by enemy action.

PLYMOUTH, ENGLAND. Transport in Rebuilt Plymouth, J. P. Watson and P. Abercrombie. *Transport World*, vol. 96, no. 3062, July 13, 1944, pp. 40–41. Report on replanning of Plymouth, England; proposals for road, rail, and air.

ROADS AND STREETS, DESIGN. Planning and Communications, A. J. Lyddon. *Roads & Road Construction*, vol. 22, no. 259, July 1944, pp. 189–193. Remarks limited to means by which passengers or freight can be transported from one part of Great Britain to another; cheap and efficient transport is important; efficiency of road system is fundamental; motorways; urban or rural service roads; trunk and classified roads; restriction of ribbon development; new ring and radial roads; bridges and level crossings. Extracts from paper before Town Planning Inst.

STREET TRAFFIC CONTROL. Traffic and City Planning, J. W. A. Bollong. *Traffic Eng.*, vol. 14, no. 11, Aug. 1944, pp. 290–292. Comprehensive city planning or master city planning has to do, first, with long-range policies and objectives, and second, with specific construction programs and schedules; traffic factors in Seattle, Wash.; interdependence of various transportation media; need for freeways; terminal parking; improved transit facilities; highways to airports.

TACOMA, WASH. Tacoma Report Recommends Wide-Reaching Projects. *Eng. News-Rec.*, vol. 133, no. 6, Aug. 10, 1944, p. 155. Comprehensive report containing series of recommendations not only for city of Tacoma, Wash., and Puget Sound area, but for Pacific Northwest region as well, is under consideration by Tacoma's City Council; it presents number of specific recommendations for highways, public buildings, parks, schools, and other improvements.

CIVIL ENGINEERING

UNITED STATES. Reclamation Proposals for Post-War. *Western-Construction News*, vol. 19, no. 8, Aug. 1944, pp. 86–90. Detailed tabulation of 236 projects proposed by Bureau of Reclamation for 17 Western states, including flood control, irrigation, power, and multiple-purpose works.

CONCRETE

AIRPORT RUNWAYS. How Modern Equipment Overcomes Labor Shortage on Seattle-Tacoma Airport Project, H. H. Edwards. *Pac. Bldr. & Engr.*, vol. 50, no. 9, Sept. 1944, pp. 34–41. Thousands of man-hours saved with efficient application of new equipment in paving with concrete, 451,000 sq yd of runways, taxiways, and aprons at Bow Lake; crew of 23 handles 12 paving operations; manner in which work was accomplished.

BEAMS AND GIRDERS. Overlapping Tensile Reinforcing Rods in Concrete Beams, R. H. Evans. *Concrete & Constr. Eng.*, vol. 39, no. 7, July 1944, pp. 167–175. Results of tests to determine effect, on method of failure and failing load, of overlapping rods over same portion of beam.

CEMENT ADMIXTURES. How to Use Air-Entraining Cements, H. G. Farmer and G. L. Lindsay. *Eng. News-Rec.*, vol. 133, no. 8, Aug. 24, 1944, pp. 214–217. Introducing air voids into concrete improves resistance to freezing, thawing, and scaling, but amount of entrained air must be carefully controlled, preferably by adding air-entraining agent to cement at mill.

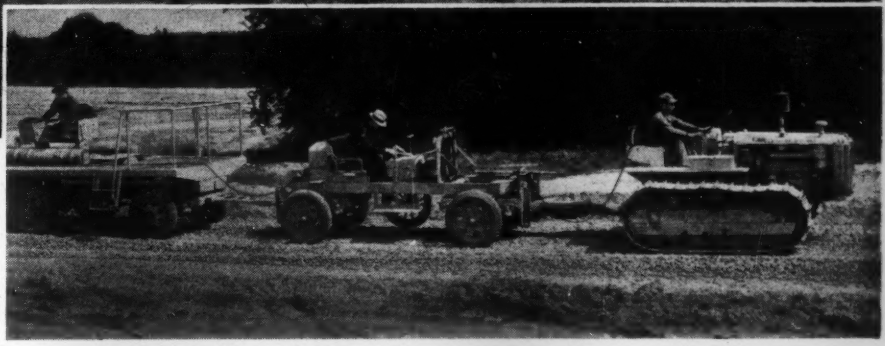
COLUMNS. Eccentrically Loaded Concrete Columns, W. S. Wilson. *Civ. Eng.* (London), vol. 39, no. 457, July 1944, pp. 154–156. Consideration of concrete members subjected to compression and bending in which section is symmetrical in regard to disposition of concrete and steel and centroid of whole section coincides with central axis of area; examples demonstrate use of formulas and curves shown, in solving eccentrically loaded columns.

CONSTRUCTION, COLD WEATHER. Concreting in Cold Weather. *Concrete & Constr. Eng.*, vol. 39, no. 6, June 1944, pp. 158–163. Notes on construction of runways at temperatures of 20 F and below. From publication of Am. Portland Cement Assn.

HANGARS. Seven Hangars with Modern Equipment in Rigid-Frame Concrete Structure, H. J. Snitoff. *Eng. News-Rec.*, vol. 133, no. 10, Sept. 7, 1944, pp. 294–298. Continuous rigid-frame concrete building encompasses seven 130 × 200-ft hangars; unusual falsework used in construction of reinforced continuous beams that support prefabricated joist and pre-cast slab roof; doors of overhead canopy type; duct

PUTTING THE PROVE IN IMPROVEMENTS

• This bucking bronco is a "Caterpillar" Diesel D2 Tractor taking one of the many "hurdles" that are designed to test its toughness on the "Caterpillar" Proving Grounds.



• A "Caterpillar" Diesel D4 Tractor pulling a drawbar dynamometer and loading car to test the pulling power of a certain grouser design in various kinds of soil surfaces.

If you happen to be a long-standing "Caterpillar" Diesel user, you know that changes and improvements go into "Caterpillar" Diesel products the minute they're ready and right. There's no waiting for "yearly models."

Through the years, "Caterpillar" has given you such notable refinements as copper bellows seals for final drive, oil coolers, absorbent-type oil and fuel filters, finger-tip steering, "Hi-Electro" hardening for many vital parts, multispeed transmissions and scores of others. The economy and dependability of the "Caterpillar" Diesel have been constantly improved. Only the basic design remains unchanged. It was *right* from the start.

Every improvement that has ever gone into a "Caterpillar" Diesel product has first been subjected to the stiffest laboratory and proving-ground tests. The net result is Product Dependability. With every manufacturing step controlled by one organization in one factory, there can be no possibility of compromise with quality.

Dependability is the outstanding characteristic of "Caterpillar" dealers, too. Today they are in a position to give your "Caterpillar" Diesel equipment the kind of inspection, adjustment, maintenance and repair it needs to work at peak efficiency from now until Victory is won. You'll find it profitable to see *your* "Caterpillar" dealer regularly.

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS

DEPENDABLE is the word for "Caterpillar" Diesel

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ARMY E NAVY

TO WIN THE WAR: WORK—FIGHT—BUY U. S. WAR BONDS!

system of electrical feeder circuits saves copper; combination of mercury vapor and incandescent fixtures; steam unit heaters, deluge sprinkler system, and separate water supply are part of project.

MIXING. Design of Concrete Mixes on Minimum Strength Basis. E. E. Morgan. *Engineer*, vol. 177, no. 4611, May 26, 1944, pp. 400–402. Aim is to produce concrete that will be strong enough, but only just strong enough, to achieve purpose for which it is required; strength and workability; average strength and minimum strength; design of mix; size of batch; allowance for surface moisture on fine and coarse aggregates.

RESERVOIRS. All-Concrete Reservoir for Port Sudan. *Concrete & Constr. Eng.*, vol. 39, no. 6, June 1944, pp. 144–145. Description of reservoir 18 ft deep and 400 ft long by 90 ft wide, with capacity of 3,000,000 gal.

SIDEWALKS, CONSTRUCTION. Method of Sidewalk Construction Avoids Cracking from Frost Heaving, E. E. W. Oke. *Eng. & Contract Rec.*, vol. 57, no. 28, July 12, 1944, pp. 10–11. Method of laying walks that will not crack even with excessive heaving is described; built in individual units; blocks will lift up and then drop back into original position.

WIND TUNNELS. Precision Forms Meet Close Tolerance Needs of Concrete Wind Tunnel. *Construction Methods*, vol. 26, no. 9, Sept. 1944, pp. 78–79, 148 and 150. Description of method used to maintain tolerances of $^1/_8$ in. in bellmouth of 450-ft continuous return reinforced concrete tube of approximately rectangular cross section, at Boeing Aircraft Company.

CONCRETE

COLUMNS. Structural Concrete Column Developed. *Constructor*, vol. 26, no. 9, Sept. 1944, p. 41. Substitute for structural columns developed, which is stronger and cheaper than steel, as light as aluminum, and composed chiefly of concrete.

DAMS

CONCRETE GRAVITY, ARGENTINA. San Roque Dam, Argentina. *Engineer*, vol. 177, no. 4616, June 30, 1944, pp. 509–510. Illustrated description of new dam on River Primero; dam is expected to provide protection from floods, and to enhance flow of water available for irrigation; it is concrete gravity structure, slightly curved in plan and has height from river bed level of about 50 m.

CONSTRUCTION INDUSTRY

POSTWAR. Planning for Postwar Construction, W. N. Carey. *Am. Water Works Assn.—J.* vol. 36, no. 7, July 1944, pp. 755–761. Discussion of various factors involved in planning and necessity for immediate action; importance of public works.

DAMS

BUTTRESS, MEXICO. Buttress Dam Without Steel, F. Barona de la O. *Western Construction News*, vol. 19, no. 8, Aug. 1944, pp. 77–78. High quality concrete with low heat cement is used by Mexican commission in construction of buttress dam 187 ft high; no reinforcement used because of steel shortage; properly placed contraction oints believed to take care of all deformations.

CONCRETE GRAVITY, ARKANSAS. Norfork Generator Start Slated About June 15. *Mfrs. Rec.*, vol. 113, no. 6, June 1944, pp. 46–47, 60. Concrete gravity structure, Norfork Dam, on North Fork River, in Baxter County, Arkansas, being built for combined purposes of flood control and generation of hydroelectric power; project is part of comprehensive plan to control floods on White and Mississippi rivers.

EARTH, IDAHO. Anderson Ranch-Progress on Highest Earthfill Dam, E. L. Armstrong; *Western Construction News*, vol. 19, no. 8, Aug. 1944, pp. 67–72. Principal dimensions, outlet works, foundation excavation and grouting, embankment construction, conveyor system, spillway and concrete plant for 456-ft-high earth-fill dam 40 miles southeast of Boise, Idaho, is described.

EARTH, IDAHO. Construction Features of Anderson Ranch Dam, World's Highest Earth Dam. *Pac. Bldr. & Engr.*, vol. 50, nos. 7 and 8, July 1944, pp. 34–41, August, pp. 36–39. Methods used in diverting stream, stripping site, constructing impervious cutoff wall, and moving more than 4,500,000 cu yd of fill material $1^1/_2$ miles by belt conveyor; grouting and concreting operations.

EXCAVATING. Dedicate Denison Dam. *Excavating Engr.*, vol. 38, no. 7, July 1944, pp. 350–353. Over 32,000,000 cu yd of material moved in excavating spillway and building main embankment of world's largest rolled-fill earth structure on Red River between Texas and Oklahoma.

FISHERIES, SACRAMENTO RIVER. Fish Conservation at Shasta, S. S. Leonard and H. A. Hanson. *Western Construction News*, vol. 19, no. 6, June 1944, pp. 72–74. Construction of Shasta Dam acts as insurmountable barrier to salmon migration; to preserve value of annual run, traps and hatcheries have been installed at two places on river and hatchery facilities set upon tributary creeks by Bureau of Reclamation.

RESERVOIRS, MAINTENANCE AND REPAIR. Rehabilitation of Reservoir, H. Boyle. *Pac. Bldr. & Engr.*, vol. 50, no. 8, Aug. 1944, pp. 59–60. Methods used in reconditioning reservoir in Roslyn, Wash., constructed in 1908; sides were of embankment and nine-tenths of floor on clay while one-tenth was bearing on sandstone, creating uneven resistance; asphaltic base lining was used, and new superimposed concrete shell, uniformly reinforced, and spaced with expansion joints combining copper water stop plates and plastic filler to permit maximum of elasticity and freedom for movement, was also added.

SPILLWAYS. Blasting a Spillway at Dreher Shoals Dam, E. R. Moore. *Explosives Engr.*, vol. 22, no. 3, May-June 1944, pp. 112–115 and 136. On Saluda River Hydroelectric Development, 14 miles west of Columbia, S.C., earth dam 208 ft high and 8,700 ft long was originally completed in 1929; following excessive rainfalls in 1938, conditions indicated necessity of enlarging spillway; description of rock excavation job involving removal of nearly half million cubic yards.

WOODEN, FAILURE. Repairing Oregon City Dam. *Pac. Bldr. & Engr.*, vol. 50, no. 6, June 1944, pp. 48–50. Methods used by Gilpin Construction Company, Portland, Ore., in repairing damage caused to log and timber dam at Oregon City plant of Hawley Pulp and Paper Company, by flooding of Willamette River; dam was portion of long U-shaped structure largely concrete, that extended around original river rapids to ship locks on opposite side.

FLOOD CONTROL

SHORE PROTECTION. Revetting River Bank at High Water. *Eng. News-Rec.*, vol. 133, no. 12, Sept. 21, 1944, pp. 356–359. Story of emergency job done on Mississippi River by Army Engineers; articulated concrete mattress was sunk along receding river bank.

FLOW OF FLUIDS

MEASUREMENT. Measurement of Sewage Flow in Open Channels, J. Tarrant. *Water Works & Sewerage*, vol. 91, no. 9, Sept. 1944, pp. 323–326. Parshall measuring flume shown to be reliable method of measuring flow; comparison with weirs and notches; section of suitable size; chart for use with flume.

FOUNDATIONS

CHIMNEYS. Support for Tall Stack on Poor Soil, C. W. Dunham. *Eng. News-Rec.*, vol. 133, no. 12, Sept. 21, 1944, pp. 350–355. Unstable foundation materials under 540-ft reinforced concrete stack necessitated construction of floating foundation and equalization of superimposed load by removal of overburden; completed foundation consists of heavily reinforced concrete slab at bottom of large shallow well formed by wall at outer rim of circular spread footing.

PILES. Design of Piled Structures, P. Garde-Hansen. *Dock & Harbour Authority*, vol. 25, nos. 283, 284, and 285, May 1944, pp. 17–21, June, pp. 37–40, and July, pp. 62–66. Outline of design given applies to general case; selection of pile material; determination of approximate pile length; selection of pile section; determination of carrying capacity per pile, and of approximate total number of piles required; distribution of piles; calculation of loads on individual piles, and redistribution and addition or omission of piles if required.

SOIL SURVEYS. Exploration of Soil Conditions, H. A. Mohr. *Civ. Eng.* (London), vol. 39, no. 456, June 1944, pp. 129–132. Necessity for investigating subsoil conditions and methods of investigation are discussed; test pits and boreholes; description of soil-boring equipment. From bulletin for use of students in Harvard Graduate School of Engineering.

WATERPROOFING. Warehouse Kept Dry by Well Points, W. Kauffman. *Western Construction News*, vol. 19, no. 6, June 1944, pp. 75–76. Storage building at Vancouver shipyards saved from destruction by percolating ground water in sand-fill foundation by installation of well-point system when concreting or surface pumping proved infeasible.

HYDROELECTRIC POWER PLANTS

CALIFORNIA. Building Hydroelectric Plant in California's Pit River Country, E. M. Seel. *Excavating Engr.*, vol. 38, no. 8, Aug. 1944, pp. 414–418, 437–438. Description of construction of plant, with particular attention to large amount of excavation work required.

CENTRAL VALLEY PROJECT. Design Features of Shasta Dam and Powerhouse. *Elec. World*, vol. 122, no. 6, Aug. 5, 1944, pp. 83–88. California's Central Valley Project, primarily irrigation and flood control development, will produce 450,000 kw of power; first two 75,000-kw units at Shasta now in operation.

NORTHWESTERN UNITED STATES. Bright Future Planned for Pacific Northwest. *Eng. & Min. J.*, vol. 145, no. 9, Sept. 1944, pp. 82–83. Bonneville power administration has comprehensive scheme, based on power, irrigation, natural resources, and population growth; tabulation of metallurgical facilities of Northwest; capacities of individual dams.

PERU. Peru Hydro Plant. *Construction Methods*, vol. 26, no. 10, Oct. 1944, pp. 64–65, 144, 150, 152, and 154. Rock tunneling and dam construction methods to be used are described.

PERU. Unusual Design Features Distinguish Hydroelectric Project. in Peru, *Eng. News-Rec.* vol. 133, no. 12, Sept. 21, 1944, pp. 266–270. Details of unusual features given; subterranean location of power house; vertical face of dam on downstream side; use of unlined pressure tunnel.

POSTWAR. Preparation of Postwar Projects, D. M. Stephens. *Water & Sewage*, vol. 82, no. 9, Sept. 1944, pp. 30, 32, and 50. Discussion of elements in stable postwar world and part which engineers, particularly in water and sewage treatment, can play in period.

INLAND WATERWAYS

CANAL LOCKS, GATES. Sector Floodgates Stop Silting of Navigation Canal. *Construction Methods*, vol. 26, no. 7, July 1944, pp. 66–69, 158, 162, 164. Description of structures being installed to protect dredged canals of Intracoastal Waterway against silting by backed-up floodwaters at crossings of Texas rivers.

UNITED STATES. U.S. Engineers River and Harbor Works, J. S. Kingman. *Excavating Engr.*, vol. 38, no. 6, June 1944, pp. 300–302. Work of U.S. Engineers on canals, flood control, power, soil erosion, and transportation is briefly noted; illustrations given.

IRRIGATION

COLORADO. Blue River-South Platte Project in Colorado, M. E. Bunger. *Mines Mag.*, vol. 34, no. 7, July 1944, pp. 344–348. Progress of irrigation in Colorado, since 1859; notes on project now under investigation by Bureau of Reclamation; comparative advantages of three alternative routes for diversion of about 750,000 acre-feet of water from headwaters of Eagle, Blue, Williams, and Fraser rivers on western slope of Continental Divide to South Platte drainage area in vicinity of Denver.

SUBSOIL DRAINS. Silt In Sub-Soil Drains, F. Nicholson. *Roads & Road Construction*, vol. 22, no. 257, May 1944, pp. 134–139. Detailed description of subsoil drainage system used by author; surface dressing; pipe drainage; cost.

PORTS AND MARITIME STRUCTURES

ALASKA BARGE TERMINAL. Constructing $20,000,000 Alaska Barge Terminal at Excursion Inlet, H. H. Edwards. *Pac. Bldr. & Engr.*, vol. 50, no. 8, Aug. 1944, pp. 40–44, 48, 52, and 54. Article explains how Guy F. Atkinson Co. fought time and how difficulties due to severe winter were overcome in construction of base for American defense supplies; summary of work done; piling; docks; marine ways; channel changes; road construction; bridges; warehouse fill; blasting 1,000,000 yd of rock; gravel; asphalt emulsion grouted pavement; sewers; water system; concreting; buildings; servicing and repairing equipment; oil storage.

DRYDOCKS, CAPE TOWN, SOUTH AFRICA. Cape Town Graving Dock. *Engineer*, vol. 177, no. 4611, May 26, 1944, p. 407. Some facts about construction of new dock, which is to be largest in southern hemisphere; estimated cost is £2,034,000; overall length 1,248 ft.

WATERWAY TRANSPORTATION, CALIFORNIA. San Francisco Ferries Again in Use. *Western Construction News*, vol. 19, no. 6, June 1944, pp. 77–78. Renovated ferries are now carrying shipyard workers to yards; project included construction of new docking and fueling facilities at each end of runs.

ROADS AND STREETS

AIRPORT RUNWAYS. Design and Evaluation of Airport Pavements, H. R. Cedergren. *Pac. Bldr. & Engr.*, vol. 50, no. 7, July 1944, pp. 42–44, 46 and 48. Providing valuable information for Air Forces and developing wealth of data that should be of value in establishing design methods of future, extensive testing program is being conducted by Corps of Engineers, U.S. Army, to determine load-carrying capacities of military airfields throughout the United States; design of airfield pavements; evaluation of existing pavements.

AIRPORT RUNWAYS, CONSTRUCTION. Big Concrete Paving Machines Build Bomber Runways in Britain, P. Murray. *Eng. & Contract. Rec.*, vol. 57, no. 28, July 12, 1944, pp. 12–14. Tremendous projects made possible by modern machines and bulk delivery of cement; sacks upped labor costs; especially constructed steel tanks; simple loading method; special cam action tailboard; railheads solved long-distance hauls; automatic pavers increasingly used.

BITUMINOUS. Report on Construction of Bituminous Surface Treatment Test Sections, A. T. Goldbeck. *Crushed Stone J.*, vol. 19, no. 2, June 1944, pp. 3–13. Report of study made of various methods for surface treating concrete pavement, using crushed stone cover, to develop methods satisfactory to State Highway Department from standpoint of durability and skid-resistance.

CONSTRUCTION. Balancing Earthwork by Graphics, O. Ondra. *Highway Mag.*, vol. 35, July-Aug. 1944, pp. 114–117. Purpose of article is to present simple graphical method of balancing earthwork in highway engineering; method also suggests possibility of determining, graphically, length of haul and overhaul; construction of mass diagram; finding centroid; application to highway problem. Bibliography.

TO WEATHER POST WAR *UNCERTAINTY*

A chemical plant designed, fabricated and erected by Blaw-Knox for large midwest manufacturer.

Naturally you want to establish yourself quickly and permanently in the post war era. To help you, Blaw-Knox offers engineering and products of wide range. It also has the facilities and personnel to manufacture for you, all or parts of your products.

One of the most important activities at Blaw-Knox is the Process Equipment Department, which among other things, specializes in the design and manufacture of equipment for the carrying out of chemical reactions by both the batch and continuous processes. This department is fully qualified to render a complete service from building pilot plants to equipment for full scale production.

Blaw-Knox leadership in the origination and fabrication of products for so many fields of industry is a ground for confidence that it can be of help to you if your business comes within the scope of its activities. Many Blaw-Knox products now of international reputation were originated to fill the needs of one manufacturer. Perhaps the Blaw-Knox umbrella of industrial coverage can include worth while services to you. May we talk it over?

BLAW-KNOX COMPANY

A PACEMAKER FOR AMERICAN INITIATIVE AND INGENUITY

FARMERS BANK BLDG.,
2060 PITTSBURGH, PA.

Buy More War Bonds and Stamps

LEWIS FOUNDRY & MACHINE DIVISION, Rolls and Rolling Mill Machinery

NATIONAL ALLOY STEEL DIVISION, Heat and Corrosion-Resistant Alloy Castings

SPECIAL ORDNANCE DIVISION, Bofors Anti-Aircraft Gun Mounts and Mechanisms

PITTSBURGH ROLLS DIVISION, Rolls for Steel and Non-Ferrous Rolling Mills

POWER PIPING DIVISION, Prefabricated Piping Systems

BLAW-KNOX DIVISION, Chemical & Process Plants & Equipment, Construction Equipment, Steel Plant Equipment, Radio & Transmission Towers . . . General Industrial Products

COLUMBUS DIVISION, Ordnance Matériel

UNION STEEL CASTINGS DIVISION, Steel and Alloy Castings

MARTINS FERRY DIVISION, Bofors Anti-Aircraft Gun Mounts

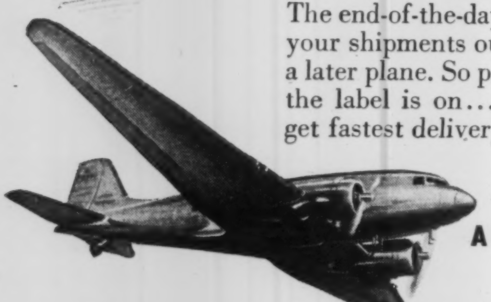
BLAW-KNOX SPRINKLER DIVISION, Automatic Sprinklers and Deluge Systems

Five Blaw-Knox Plants have been awarded the Army-Navy "E" for war-production excellence

A FEW VICTORY PRODUCTS

ANTI-AIRCRAFT GUN MOUNTS · GUN SLIDES · LANDING BARGES · AERIAL BOMBS · POWDER PLANTS · PIPING FOR NAVAL VESSELS · SYNTHETIC RUBBER PLANTS · CAST ARMOR FOR TANKS & NAVAL CONSTRUCTION · CHEMICAL PLANTS

AIR EXPRESS
AIR EXPRESS
AIR EXPRESS



It's label'd

AIR EXPRESS

...but it can't take off from your shipping room floor!

Ship When Ready for Fastest Delivery

The end-of-the-day rush at the airport may nudge your shipments out of the race, defer them until a later plane. So phone for a pick-up the moment the label is on... or before! That's the way to get fastest delivery!

SPECIFY AIR EXPRESS
A Money-Saving, High-Speed Tool for Every Business

With additional planes now available for all important types of traffic, 3-mile-a-minute Air Express directly serves hundreds of U.S. cities and scores of foreign countries. Thousands of shippers are saving substantial sums through Air Express, employing its economy and efficiency in an ever-increasing number of ways.

WRITE TODAY for "Quizzical Quiz"—a booklet packed with facts that will help you solve many a shipping problem. Dept. PR-12, Railway Express Agency, 230 Park Avenue, New York 17, N. Y., or ask for it at any local office.

AIR EXPRESS
Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION
Representing the AIRLINES of the United States

CURBS. Street Intersections. Alignment of Kerbs, H. Criswell. *Roads & Road Construction*, vol. 22, nos. 258 and 259, June 1944, pp. 158–161, July, pp. 195–198. One of most important details in design of street intersections in towns and built-up areas is alinement of curbs at corners; relative dimensions of design; definition of minimum turning radius; overhang of vehicle; extra width occupied by turning vehicles; assumed dimensions of vehicles; three forms of four-way intersection.

DESIGN. Geometric Design of Highway Alignments and Highway Intersections, R. H. Baldock. *Oregon State Highway Commission—Tech. Report* No. 43–44, Oct. 1943, 38 pp. Geometric design of highway alinements with relation to selected speeds; factors controlling selection of speed to be used; basis for design of highway alinements; horizontal curvature; non-passing and passing sight distance; design of horizontal curves; stopping and measuring sight distance; design of safe passing sight distance; transition curves; highway intersections discussed.

DESIGN. Thickness of Flexible Pavements for Highway Loads. *Roads & Road Construction*, vol. 22, no. 258, June 1944, pp. 166–171. Soil classifications; granular soils; fine soils; recommended practice for designing thickness of flexible type pavement; bituminous surface; base course; sub-base; proposed modified soil classification; method of test for capillary rise of soil; permeability of porous granular materials. Extracts from Wartime Road Problems, No. 8, issued by U.S. Highway Research Board, Dec. 1943.

EMBANKMENTS. Research on Construction Embankments, H. Aaron, W. T. Spencer, and H. E. Marshall. *Pub. Roads*, vol. 24, no. 1, July-August-September 1944, pp. 1–26. Report on cooperative research with reference to fill-construction experiments in Indiana and Ohio; experiments were similar in number of respects, including principal objectives, soil variables, control procedures, and types of compacting equipment used; results of both experiments lead to similar conclusions; as result, much of material included in one of reports is duplicated in other.

HIGHWAY SYSTEMS, BRITISH COLUMBIA. Nine Major Highway Projects in British Columbia, A. Dixon. *Roads & Bridges*, vol. 82, no. 5, May 1944, pp. 47–49, 72–73. Program, prepared by Provincial Public Works Dept., covers following projects: Trans-Canada Highway, Southern Trans-Provincial Highway, Island Highway, Northern Trans-Provincial Highway, B.C.-Yukon-Alaska Highway, Cariboo Highway, North Thompson Highway, Vancouver-New Westminster Express Highway, and Parks Highways; estimated costs are given.

HIGHWAY SYSTEMS, PERU. Ocean-to-Amazon Highway, J. L. Schley. *Highway Mag.*, vol. 35, July-Aug. 1944, pp. 100–103. Features of ocean-to-Amazon highway which connects Peru's Pacific coast ports with upper Amazon Valley; map, showing highway connection from Lima to Pucallpa and water connections with Atlantic Ocean, is given.

HIGHWAY SYSTEMS, PLANNING. Post-War Highways and Photogrammetry, F. E. Junior. *Am. Highways*, vol. 23, no. 3, July 1944, pp. 3–6, and 14. Practical application of photogrammetry, in solution of some of highway planning problems; multiple uses of photogrammetry in themselves readily indicate need of its application to postwar highway program; in locating highways these photographs, when made into mosaic, permit general observations to determine routes that may be desirable.

INTERSECTIONS. Four Level Grade Separation for Los Angeles Parkways Intersection, S. V. Cortelyou. *Calif. Highways & Pub. Works*, vol. 22, nos. 5 and 6, May-June 1944, pp. 8–9 and 17. Proposed grade separation on State Highway 165, Arroyo Seco Harbor Parkway; basic feature is that four separate roadway levels are so arranged as to pass one another at one point in single bridge structure; two major parkways intersect one another at right angle and on different levels, while two pairs of interchange roadways occupy level each, in positions bisecting quadrants made by main parkway crossing.

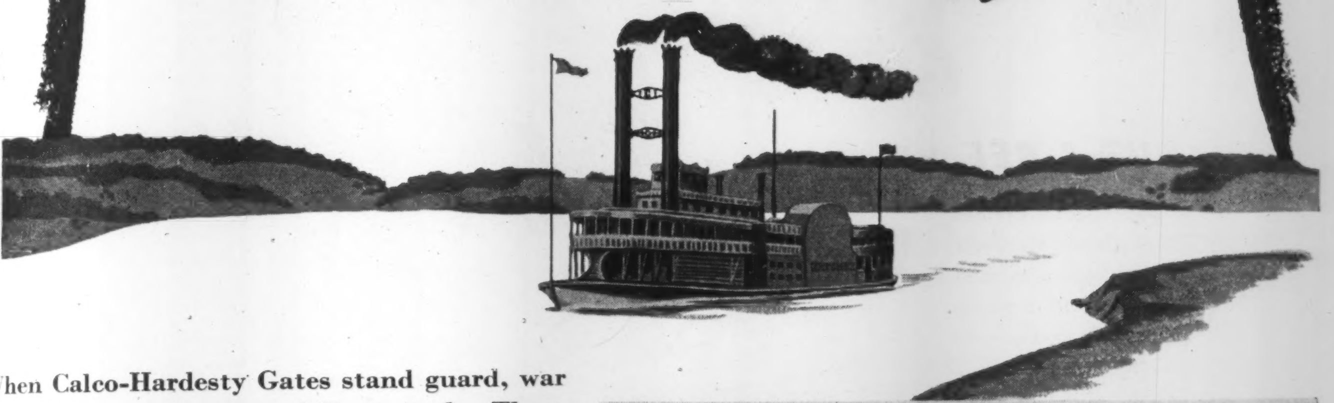
MAINTENANCE AND REPAIR. Oceana County Uses Million Gallons of Brine a Year, C. M. Stover. *Pub. Works*, vol. 75, no. 6, June 1944, pp. 27, 68, and 70. Because of its location near sources of brine which possessed characteristics favorable to dust laying, Oceana County, Michigan, found use of this brine cheaper than flake calcium chloride which it had used previously to abate dust and maintain 200 miles of gravel roads in as smooth condition as possible.

SASKATCHEWAN. Postwar Highway Construction Program for Saskatchewan, H. R. MacKenzie. *Roads & Bridges*, vol. 82, no. 5, May 1944, pp. 44–46, 84–87. In anticipation of establishment of national postwar public-works construction program, Saskatchewan Dept. of Highways and Transportation has given consideration to most logical provincial projects, including highways of interprovincial and international importance, secondary system of paved highways, development of roads and bridges.

SNOW AND ICE CONTROL, ALASKA HIGHWAY. Winter Road Maintenance on Alaska Highway,

NOW OLD MAN RIVER

Can't "dilute" the War Effort



When Calco-Hardesty Gates stand guard, war production continues at full strength. These tried-and-proved gates eliminate the danger of high water flooding valuable property.

In war as in peace Calco-Hardesty Gates are ideal for drainage, flood control, sewer outfalls and wherever else backwater is a hazard. Unskilled labor can easily install them on any type of drainage construction. They they are ready to say "NO" firmly when backflow threatens. Under normal conditions outflow is free and easy.

There is a size and type of gate to meet every requirement. These include automatic drainage gates that open and close without power or supervision; light- and heavy-duty slide gates; and automatic radial gates to keep water levels constant.

If you cannot get Calco-Hardesty Gates now for other than the most important war projects, remember them for the future. When the war is over they will be ready again to help protect valuable civilian property. Meanwhile write us for specific information. Armco Drainage Products Association, 315 Curtis St., Middletown, O.

ARMCO

CALCO-HARDESTY GATES

UP A TREE

because the tracing papers you use just won't stand up under frequent corrections or constant handling?

PUT A BEE

in your boss's bonnet to give tracing papers the old heave-ho, and to switch to tracing cloths . . . *Arkwright Tracing Cloths!*

MEMO
Chief — wonder if you'd get us some Arkwright

YOU'LL SOON SEE

that frequent corrections and constant handling don't hurt Arkwright Tracing Cloths a bit. In the long run, you'll also see they cost no more than tracing papers. Arkwright Finishing Co., Providence, R. I.

Sold by leading drawing material dealers everywhere

Arkwright

TRACING CLOTHS

AMERICA'S STANDARD FOR OVER 20 YEARS

H. R. Flint. *Eng. & Contract Rec.*, vol. 57, no. 32 Aug. 9, 1944, pp. 30–34. Article explains ho snow removal and ice control were handled; illus trated description of equipment used.

SANITARY ENGINEERING

Canada, Postwar. Postwar Work in Albert in Waterworks and Sewerage Fields, D. B Menzies. *Water & Sewage*, vol. 82, no. 6, Jun 1944, pp. 25, 51. Discussion of plans by municipalities on postwar work in water works and sewerage fields.

Military Engineering. Sanitary Engineering Services in First Service Command, R. N Clark. *Pub. Works*, vol. 75, no. 6, June 1944, pp. 20–22, 74, 76, and 78. Article outlines duties and explains how Sanitary Corps of U.S. Army Medical Department controls water supplies, sewage disposal, mosquito and vermin, as well as general sanitation of Army camps.

SEWERAGE AND SEWAGE DISPOSAL

Grease Removal. Conservation and Salvage of Edible Grease in Fifth Service Command, U.S. Army, A. E. Stilson. *Pub. Works*, vol. 75, no. 6, June 1944, pp. 24–26. Grease recovered from grease traps and sewage more than doubled since plan was put in operation; while civilian waste of grease into sewer is 60% of what he receives for food, that at Army camps is only 25%; illustrations and drawings of skimming and flotation equipment.

Jackson, Mich. Interesting Extracts from Operation Reports, A. B. Cameron. *Sewage Works, J.*, vol. 16, no. 5, Sept. 1944, pp. 995–1000. Extracts give description of plant, mechanical problems, diffuser maintenance, gas-collecting digesters, equalization of industrial waste flow, etc.

Sewage Treatment, United States. Present Trends in Sewage Treatment. *Pub. Works*, vol. 75, no. 8, Aug. 1944, pp. 11–15 and 24. Data obtained by U.S. Public Health Service, with reference to latest practice in methods and equipment for sewage treatment; details of 280 plants constructed since 1940 provide comprehensive idea of what sanitary engineers of country consider to be best up-to-date designs for plants of all sizes, from smallest to largest.

Sewers, Quebec. Intercepting Sewer System in Quebec City, J. G. Chenevert. *Eng. J.*, vol. 29, no. 9, Sept. 1944, pp. 503–512. Development and description of system, about two-thirds of which has been built.

Sludge. Design of Sludge Handling Facilities. P. E. Langdon. *Sewage Works J.*, vol. 16, no. 5, Sept. 1944, pp. 899–908. Devices and methods under consideration for Hunts Point, N.Y., sewage treatment works are discussed.

Treatment Plants, Indiana. Indiana to Triple Investment in Sewage Treatment Plants, J. L. Quinn, Jr. *Sewage Works Eng. & Mun. Sanitation*, vol. 15, no. 9, Sept. 1944, pp. 440–441. Discussion of program of stream pollution control by adequate sewage treatment.

Treatment Plants, Tucson, Ariz. New Additions to Tucson Sewage Works, R. M. Cushing. *Pub. Works*, vol. 75, no. 8, Aug. 1944, pp. 20–24. Details of additions made to 16-year-old sewage treatment plant of Tucson, Ariz., which provides primary treatment and broad irrigation; plant had to be enlarged to double capacity, including pumping to higher land for irrigation; elimination of hydrogen sulfide from sewers.

STRUCTURAL ENGINEERING

Hangars, Wooden. Long Span Laminated Timber Arches for Aircraft Hangar, A. Zweig. *Eng. News-Rec.*, vol. 133, no. 12, Sept. 21, 1944, pp. 347–349. Three-hinged laminated arch ribs of $7^1/_2 \times 36$-in. cross section and 171-ft span serve as principal framing; procedure followed in designing arches is described, together with method to accommodate wind loads on ends of structure.

TRAFFIC CONTROL

Intersections. How Oregon Solved Major Problem of Traffic Congestion. *Pac. Bldr. & Engr.*, vol. 50, no. 6, June 1944, pp. 53–56 and 91. To solve Oregon's most serious traffic problem, Denver-Union traffic interchange on Pacific Highway north of Portland was completed last December; officially $^1/_3$ mile in length, project consists of direct traffic interchange facility, including combinations of one-direction traffic lanes and traffic-separation structures, sections of river levee and miscellaneous appurtenant work; constructional details.

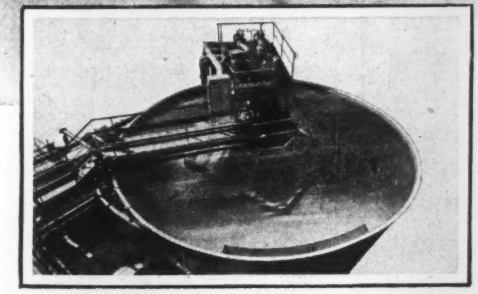
TUNNELS

Railroad, Montana. Driving New Bozeman Pass Tunnel for Northern Pacific. *Pac. Bldr. & Engr.*, vol. 50, no. 9, Sept. 1944, pp. 44, 46, and 48. In partially shattered rock paralleling Northern Pacific Railway's present 60-year-old concrete and brick-lined Bozeman Pass tunnel, in Montana, drilling and blasting are 75% complete, and concrete work is well under way for new single-track tunnel, 3,015 ft long; manner in which work is being carried out is detailed.

Water Supply. Removable Bulkhead for Water Tunnel. *Eng. News-Rec.*, vol. 133, no. 8, Aug. 24, 1944, pp. 241–244. All-steel removable bulkhead, installed 116 ft below ground in vertical shaft, protects 13-ft tunnel under construction

The skill that makes sea water drinkable for him...

..can give your entire city a soft, sparkling water supply



PERMUTIT SPAULDING PRECIPITATOR removes water hardness, dirt and color by the sludge blanket process. This new-design equipment cuts detention time, saves chemicals, takes only half the space of former methods. Present installations handle capacities up to 120,000,000 gallons daily.

Latest example of Permutit's service to our country at war is the kit which takes the salt out of sea water to keep alive our flyers forced down at sea. After the war Permutit's long experience in water treatment will help to build a happier, healthier America. For instance, recent developments by Permutit* make it more practical and economical than ever for municipalities to enjoy good water supplies—free of hardness, dirt and iron.

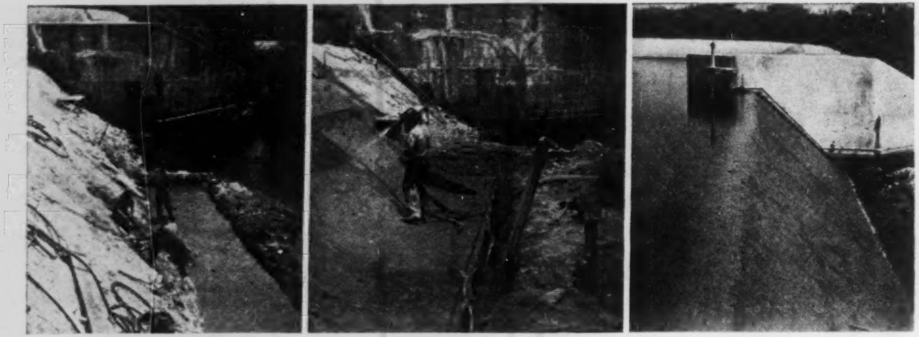
Many cities have put good water at the top of their lists of post-war improvements. Plan it now for *your* community! Write for full details to The Permutit Company, Dept. A14, 330 West 42nd St., New York 18, N. Y. In Canada: Permutit Company of Canada, Ltd., Montreal.

*Trademark Reg. U. S. Pat. Off.

PERMUTIT

• WATER CONDITIONING HEADQUARTERS •

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



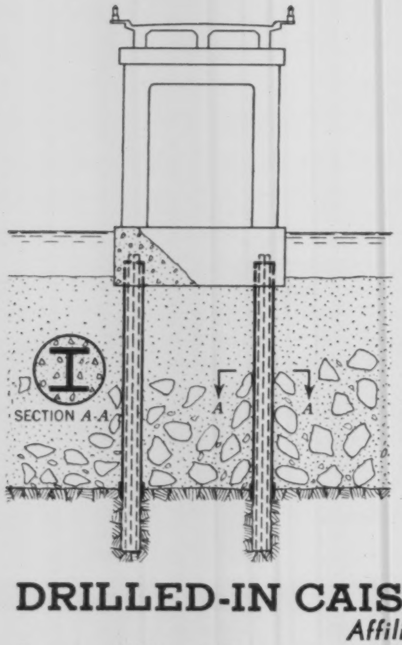
REHABILITATED WITH "GUNITE"

This is the Lower Doughty Pond Dam of the Atlantic City, N. J., Water Department, a poured concrete structure with fresh water upstream and a tide water downstream toe. Some years ago it became badly eroded, as shown by the left-hand photo. The center photo shows "GUNITE" being placed to a minimum of 6" with double reinforcing. The right-hand view shows the finished job, completed by us in 1941. Both upstream and downstream faces were reintegrated, as well as the wing walls.

Many municipalities have saved big money by the use of "GUNITE" in their reservoirs and sewers. Read how in our Bulletin 2200. We'll send it on request.

MANUFACTURERS OF THE "CEMENT GUN"

FOUNDATIONS FOR POST WAR BRIDGES



DRILLED-IN CAISSONS
anchored in Rock Sockets

These patented foundations are designed for heavy loads—up to 1500 tons on a single caisson—and can be sunk to great depths through difficult ground.

Send for catalog and reprints descriptive of jobs done.

DRILLED-IN CAISSON CORPORATION
Affiliated with
Spencer, White & Prentis, Inc.
10 East 40th St.
New York 16, N. Y.

Western Foundation Co.
155 East 42nd St.
New York 17, N. Y.

from water flowing through existing 8-ft tunnel immediately overhead.

WATER PIPE LINES

CULVERTS. Making Culverts from Penstock Pipes, O. L. King. *Pub. Works*, vol. 75, no. 6, June 1944, pp. 19 and 31. Stream which drains part of Montrose, Colo., and adjacent territory, flows through 13 culverts and wooden bridges, some of which are of inadequate capacity at high water periods; because of war priorities, two 50-ft culverts were made with 7.5-ft steel pipes used as penstocks by near-by abandoned power plant; manner in which work was accomplished; note on equipment used.

WATER RESOURCES

WATER SUPPLY, LONDON. London Water Supply, H. Berry. *Am. Water Works Assn.—J.*, vol. 36, no. 7, July 1944, pp. 703–724. History of development of London water supply system given in detail.

WATER SUPPLY, TULSA, OKLA. How Tulsa Met a Water Supply Deadline. *Eng. News-Rec.*, vol. 133, no. 10, Sept. 7, 1944, pp. 279–283. Filtration facilities enlarged, pumps added, and distribution system extended to serve major war plants.

WATER TREATMENT

AUSTIN, TEX. Water Treatment at Austin, Tex., A. R. Davis. *Water Works Eng.*, vol. 97, no. 19, Sept. 20, 1944, pp. 1128–1130. Outline of development of Colorado River supply and treatment; growth in consumption; filter-plant-operation statistics for 1943, including hardness reduction, chemical dosage, and chemical costs.

FAYETTEVILLE, N.C. One City's War Plant—Its Water Works. *Am. City*, vol. 59, no. 6, June 1944, pp. 74–75. Article explains how Fayetteville, N.C., built new 3-mgd water treatment plant to supply vital, war-boosted population; cleaning operation; reserve storage.

FILTRATION PLANTS, MOBILE, ALA. Mobile Has New Filtration Plant. *Water Works & Sewerage*, vol. 91, no. 9, Sept. 1944, p. 322. Brief description of plant with capacity of 20 mgd.

TASTE AND ODOR CONTROL. Taste and Odor Problems at Winnipeg, W. D. Hurst. *Eng. & Contract Rec.*, vol. 57, no. 30, July 26, 1944, pp. 8–12. Method of treatment considered; experiments with break-point chlorination; layout of reservoirs, pumping station, and treatment points, water supply system, City of Winnipeg, Manitoba, is given.

TREATMENT PLANTS, ROCKY MOUNT, N.C. How Rocky Mount, N.C., Strengthened Its Water Supply Facilities. *Am. City*, vol. 59, no. 7, July 1944, pp. 73–74. Brief description of water-treatment plant of Rocky Mount, N.C.; new pumps and filter units boost supply to 6¾ mgd.

UNITED STATES. Present Trends in Water Treatment. *Pub. Works*, vol. 75, no. 7, July 1944, pp. 13–16. Data indicating present trend in water treatment based upon census of water treatment plants in continental United States undertaken by U.S. Public Health Service; methods embodied in 274 plants constructed during 1941 and 1942, tabulated by states and population groups, show widespread use of most up-to-date ideas and devices.

WATER ANALYSIS. Chemical Analysis of Water, G. Carter. *Water & Water Eng.*, vol. 47, no. 580, Sept. 1944, pp. 390–396. Various examples of methods of water treatment which are essentially chemical; chlorination, water softening, coagulation, ferruginous water, water for industrial purposes, detection of pollution; feed-water treatment.

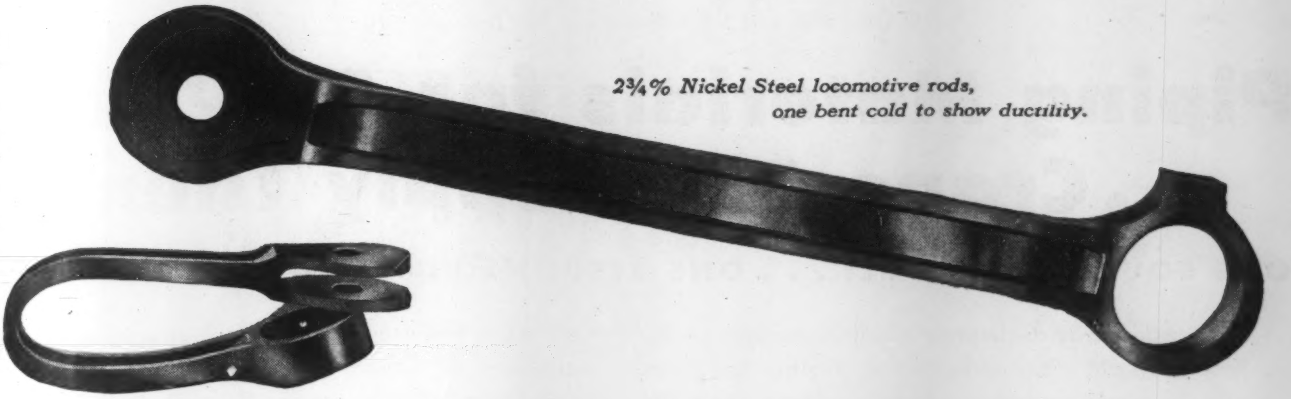
WATER BACTERIOLOGY. Bacteriological Analysis of Water, E. W. Taylor. *Water & Water Eng.*, vol. 47, no. 580, Sept. 1944, pp. 396–402. Review of methods by which bacteriology aids water engineer; determination of amount and types of bacteria, scope and extent of purification needed, effectiveness of each stage of purification, and safety of final product.

WILMINGTON. Salt-Free Water for Wilmington. *Eng. News-Rec.*, vol. 133, no. 10, Sept. 6, 1944, pp. 301–304. Construction of 7-mgd treatment plant 21-mile pipe line, and pumping station; treatment plant provides for rapid sand filtration and use of alum, soda ash, lime, chlorine, and ammonia; 708-ft section of flexible joint cast iron pipe 30 in. in diameter pulled into place in order to extend pipe line across river; larger part of supply conduit, constructed of reinforced concrete pipe, is supported on timber-pile bents.

WATER WORKS ENGINEERING

NEWPORT, R.I. How Newport, R.I., Met Emergency Water Supply Program, H. E. Watson. *Am. City*, vol. 59, no. 5, May 1944, pp. 85–87. Details of Lawton Valley filtration plant—feature of which is installation of upflow sludge blanket type Spaulding Precipitator; plant also uses so-called break-point chlorination to purify water; standpipe reservoir; submarine main; wood construction; supply increased.

POSTWAR. Postwar Planning, J. M. Hepler. *Am. Water Works Assn.—J.*, vol. 36, no. 9, Sept. 1944, pp. 989–990. Brief discussion of what should be done in planning.



2¾% Nickel Steel locomotive rods, one bent cold to show ductility.

QUENCHED AND TEMPERED

NICKEL STEEL

FORGINGS COMBINE

EXCEPTIONAL DUCTILITY WITH HIGH TENSILE STRENGTH

Composition and Typical Properties of Normalized Quenched and Tempered 2¾% Nickel Steel Rods

Description or Size	Melt Yield Pt. No. #s per Sq. In.	Tensile Strength #s per Sq. In.	Elong. % in 2 In.	Reduction in Area %	ANALYSIS					
					Car.	Mang.	Phos.	Sul.	Sil.	Ni
Main Rod....	92900	110000	25.0	64.4	.31	.78	.027	.026	.25	2.75
Main Rod....	86500	104500	25.5	65.6	.32	.86	.034	.032	.29	2.69
Main Rod....	86360	104400	26.0	64.8	.32	.86	.034	.032	.29	2.69
Main Rod....	87850	102350	26.0	66.2	.31	.89	.037	.025	.32	2.69
Front Rod....	86000	102250	25.0	67.3	.29	.82	.035	.027	.24	2.71
Front Rod....	83900	104250	25.0	66.1	.29	.82	.035	.027	.24	2.71
Front Rod....	86850	104250	27.0	66.1	.32	.86	.035	.025	.30	2.65
Front Rod....	89500	107050	25.5	65.6	.32	.86	.035	.025	.30	2.65
Back Rod....	89500	107650	25.0	62.7	.30	.79	.030	.025	.22	2.71
Back Rod....	87500	106450	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	87000	105600	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	88150	104850	26.0	66.8	.29	.82	.035	.027	.24	2.71

Specimens Taken from Mid-Section of Prolongations of the Forgings

The above table compiled by the American Locomotive Company shows the chemical compositions and mechanical properties of some normalized, quenched and tempered nickel steel front, main and back rods recently produced as replacement rods for locomotives being speeded up and rebalanced. These values are typical of replacement rod forgings recently tested by that company.

Quenched and tempered nickel steel forgings provide high tensile strength and ductility, combined with unusual toughness and high fatigue strength—qualities which tend to obviate breakage and assure long, trouble-free service when employed in heavy duty machinery and equipment.

NICKEL ALLOYS

Catalog "C"

makes it easy for you to get booklets and bulletins on industrial applications of Nickel, metallurgical data and working instructions. Why not send for your copy today?

★ ***Nickel*** ★

THE INTERNATIONAL NICKEL COMPANY, INC., ***67 Wall Street, New York 5, N. Y.***

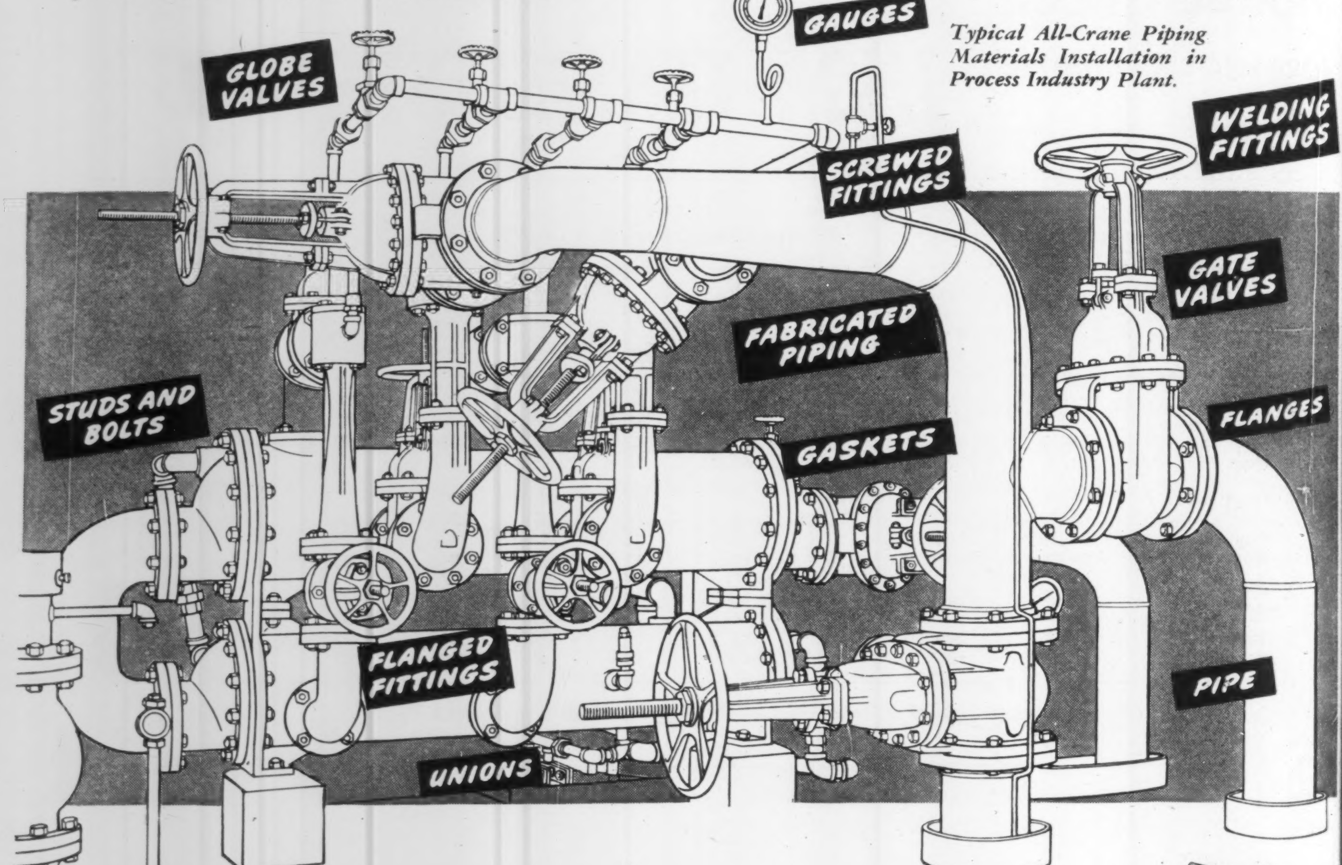
CIVIL ENGINEERING, December 1944. Vol. 14, No. 12. Published monthly by the American Society of Civil Engineers. Publication office at 20th and Northampton Sts., Easton, Pa. Editorial and advertising departments at the headquarters of the Society, 33 W. 39th St., New York, N. Y. Price 50c a copy, $5.00 a year in advance, $4.00 a year to members and to libraries and $2.50 a year to members of Student Chapters. Canadian postage 75c and foreign postage $1.50 additional. Entered as second class matter September 23, 1930, at the Post Office at Easton, Pa., under the Act of August 24, 1912, and accepted for mailing at a special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized on July 5, 1918.

Piping Materials for Any Need ...Crane Can Supply Them

ONE SOURCE OF SUPPLY . . . ONE RESPONSIBILITY FOR ALL EQUIPMENT

The easiest way to dispose of piping supply problems is to put them up to Crane. Doing that gives you the world's greatest selection of equipment for every service—power or processing systems, high or low working pressures. All your needs of valves, fittings, pipe, fabricated assemblies and piping accessories are supplied from one single source—your local Crane Branch or Wholesaler.

Now when you are trying to catch up with deferred maintenance, Crane *complete* piping materials service is a big advantage. From ordering to installation, every step of the job is simplified. And while one responsibility for materials helps assure the best installations, you are also getting full benefit of Crane Co.'s 89-year experience and leadership in the piping equipment field.



Typical All-Crane Piping Materials Installation in Process Industry Plant.

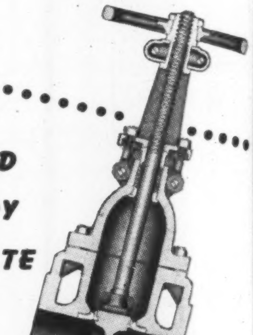
ONE STANDARD OF QUALITY

Dependable quality guards every part of piping systems when you specify Crane materials throughout. Such quality is exemplified by Crane Iron Body Wedge Gate Valves. Strong body sections resist severest strains. Straight-through ports permit unrestricted flow. A deep stuffing box lengthens packing life. Long guides keep disc travel true, while the finest design in every part assures long life and smooth, trouble-free service.

Crane Co., General Offices: 836 S. Michigan, Chicago 5, Ill.

Branches and Wholesalers Serving All Industrial Areas

STANDARD IRON BODY WEDGE GATE VALVES



CRANE

VALVES · FITTINGS · PIPE .
PLUMBING · HEATING · PUMPS

WHAT TO DO ABOUT Winter Concreting

HEAT-CURED only one day at 70°, 'Incor' concrete is service-strong, safe from freezing . . . and at 28 days produces strengths 25% to 30% greater than even Lone Star Cement concrete cured 3 days. Seventeen years' performance proves that 'Incor' 24-Hour Cement makes winter work safe, quick, economical.

SAVES 2 DAYS HEAT PROTECTION ON EACH POUR

CUTS FORM AND TARP COSTS IN HALF

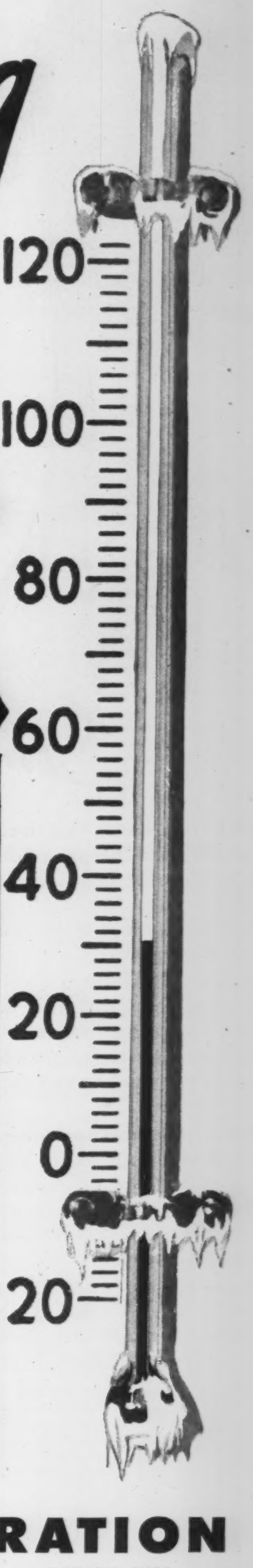
REDUCES FREEZING RISK

KEEPS JOB SPEED UP—JOB COSTS DOWN

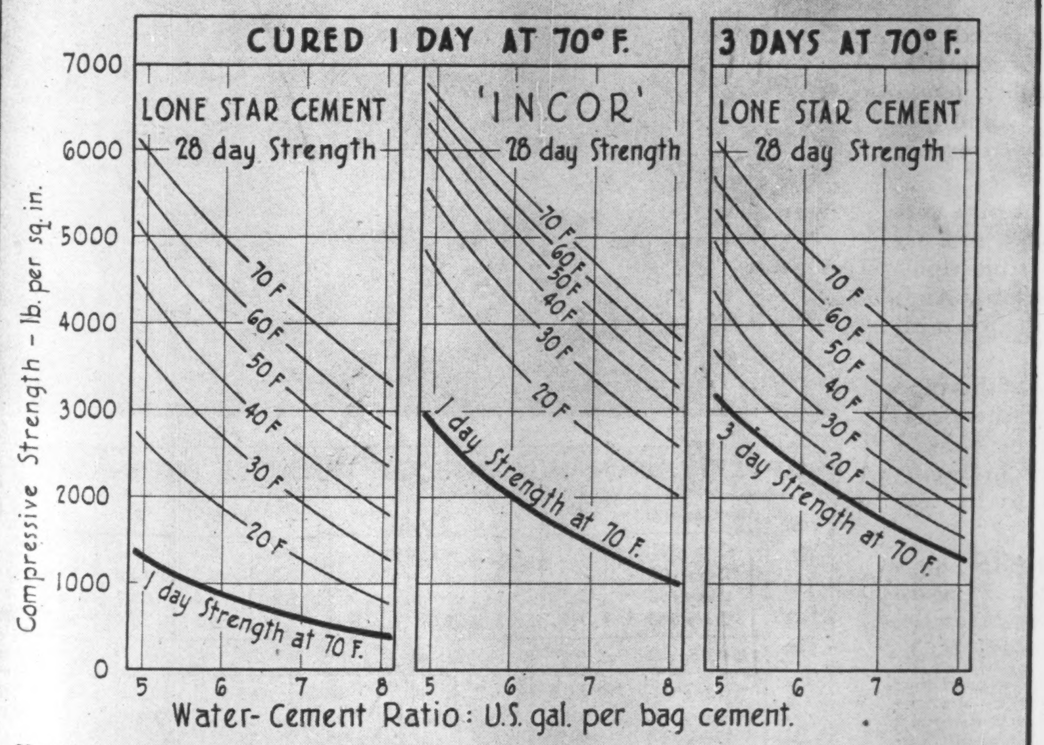
Plan and build it with 'Incor'*. Write us at 342 Madison Avenue, New York 17, for "Winter Concreting Book."

*Reg. U.S. Pat. Off.

LONE STAR CEMENT CORPORATION
94 LBS NET
PORTLAND CEMENT
LONE STAR CEMENT CORPORATION
INCOR
94 LBS NET
HIGH EARLY STRENGTH PORTLAND CEMENT



120
100
80
60
40
20
0
20



28-DAY STRENGTH OF CONCRETE EXPOSED TO COLD TEMPERATURES AFTER 1 AND 3 DAYS CURING AT 70°F

LONE STAR CEMENT CORPORATION

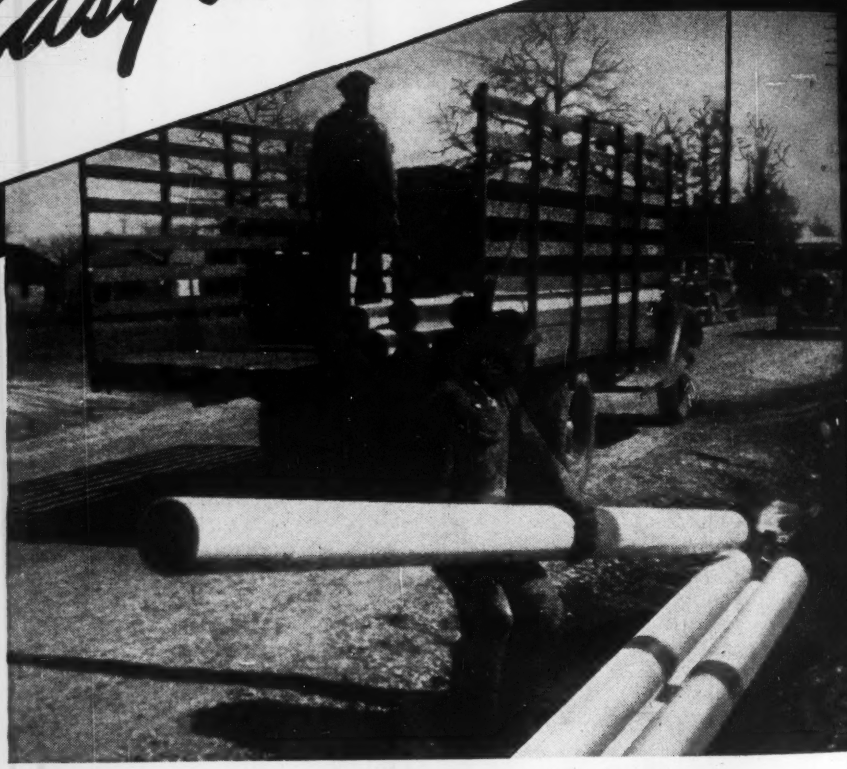
Offices: ALBANY • BIRMINGHAM • BOSTON • CHICAGO • DALLAS • HOUSTON • INDIANAPOLIS • JACKSON, MISS.
KANSAS CITY, MO. • NEW ORLEANS • NEW YORK • NORFOLK • PHILADELPHIA • ST. LOUIS • WASHINGTON, D. C.

LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25 MILLION BARRELS ANNUAL CAPACITY

These advantages make

TRANSITE PIPE

Easy to handle!



MORE FOOTAGE can be carried per truck load because Johns-Manville Transite Pipe is light in weight... fewer men are needed for handling... and mechanical equipment is not needed except for the larger sizes.

Besides, this asbestos cement pipe cuts installation costs in other ways, too. Its Simplex Coupling makes possible tight, flexible joints, and fast, easy assembly. And, Transite Pipe may be cut on the job with an ordinary saw.

Another outstanding feature of this pipe is that it is non-metallic and, therefore, its high flow rate can never be choked off by tuberculation. Transite's high corrosion-resistance contributes to its low maintenance cost.

Get the full story about Transite Pipe's many advantages. Write for Transite Pressure Pipe Brochure TR-11A, Johns-Manville, 22 E. 40th Street, New York 16, N. Y.

Blueprint
Now!

Plan now to improve and expand your water and sewerage systems after the war. For a copy of "Blueprint Now!", write the Committee on Water and Sewage Works Development, Suite 2110, 500 Fifth Ave., New York 18, N. Y.

APPROXIMATE WEIGHTS OF TRANSITE PRESSURE PIPE

Pipe Wt. Lb. Per Lin. Ft. Including Coupling and Rubber Rings	Pipe Size (I.D.) →	3"	3½"	4"	4½"	5"	6"	7"	8"	10"
	Class 50	3.9	4.6	5.2	6.0	6.8	8.3	10.1	12.6	16.5
	Class 100	4.2	4.8	5.5	6.2	7.0	8.5	10.6	12.8	21.3
	Class 150	5.0	5.9	6.7	8.0	9.4	11.6	15.2	18.0	29.9
	Class 200	7.3	8.3	9.3	10.9	12.8	16.6	20.9	25.2	39.7
	Pipe Size (I.D.) →	**12"**	**14"**	**16"**	**18"**	**20"**	**24"**	**30"**	**36"**	
	Class 50	21.3	26.8	33.0	38.6	45.6	60.1	96.2	136.0	
	Class 100	29.4	39.3	50.4	62.5	76.4	107.5	164.2	230.5	
	Class 150	41.1	55.5	69.8	87.2	106.8	152.1	241.7	346.5	
	Class 200	52.7	71.7	93.3	119.6	149.2	213.3	333.0	466.8	

*Class designation represents maximum working pressure.

JOHNS MANVILLE
JM
PRODUCTS

Johns-Manville *TRANSITE PIPE*

An asbestos product for efficient, economical water and sewer lines

5
big advantages of
PORUS-KROME*

1 **Porus-Krome** applied to the cylinder walls of gasoline and Diesel engines multiplies the life of the cylinders from 4 to 20 times.

2 **Porus-Krome** on the cylinder walls multiplies the life of the ordinary piston rings from 3 to 5 times.

3 **Porus-Krome**, with its thousands of tiny pores and channels which hold lubricating oil and feed it back as needed, improves lubrication and holds lubricating oil consumption at a constant low level.

4 **Porus-Krome** and piston rings wear so slowly that high power development is maintained for many more hours . . . many more miles . . . than with ordinary cylinders.

5 **Porus-Krome** means greater engine reliability because it reduces scoring and scuffing and the risk of piston seizure and because it cuts down the number of overhauls caused by cylinder and ring wear.

All of these advantages add up to a substantial saving in engine operating costs.

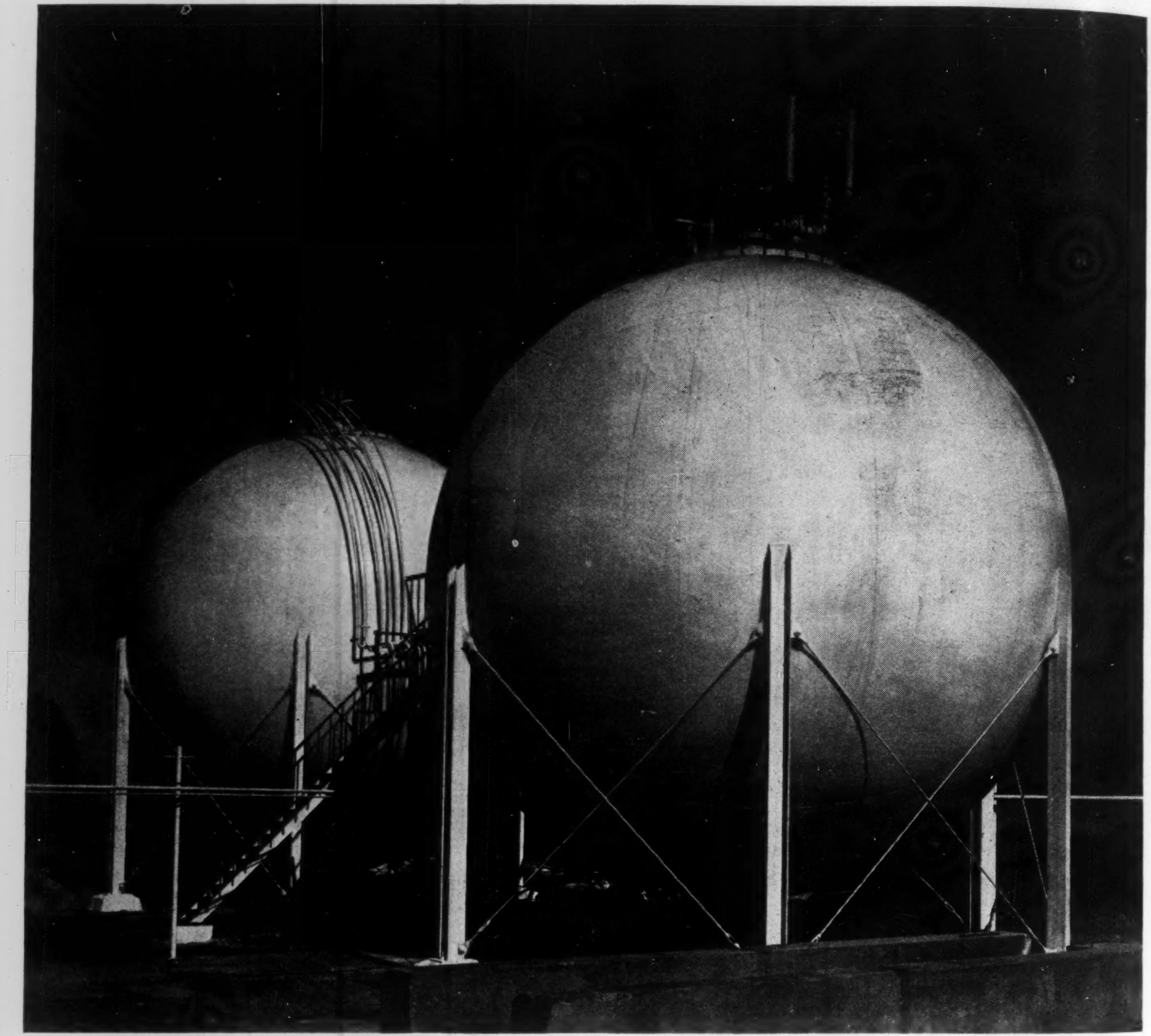
* Porus-Krome is pure, hard chromium which is applied to cylinder bores by the patented Van der Horst process. It has tiny pores and channels in its surface which serve as reservoirs for lubricating oil, feeding it back as needed. It reduces corrosion and wear and multiplies cylinder life 4 to 20 times.

VAN DER HORST
TRADE MARK
U. S. PATENTS 2,048,578 AND 2,314,604

PORUS - KROME

Good for the Life of your Engines

VAN DER HORST CORPORATION OF AMERICA
OLEAN • NEW YORK
CLEVELAND 11 • OHIO
AN AFFILIATE OF DRESSER INDUSTRIES



Tailor-Made...*for Storing Anhydrous Ammonia*

HORTONSPHERES have become a familiar sight at refineries, chemical plants, synthetic rubber plants and other types of industries where it is essential to provide efficient storage for volatile products. Butane, butadiene, alkylate, anhydrous ammonia, helium, various industrial gases and sewage gas at disposal plants are a few of the many products that are being stored in Hortonspheres.

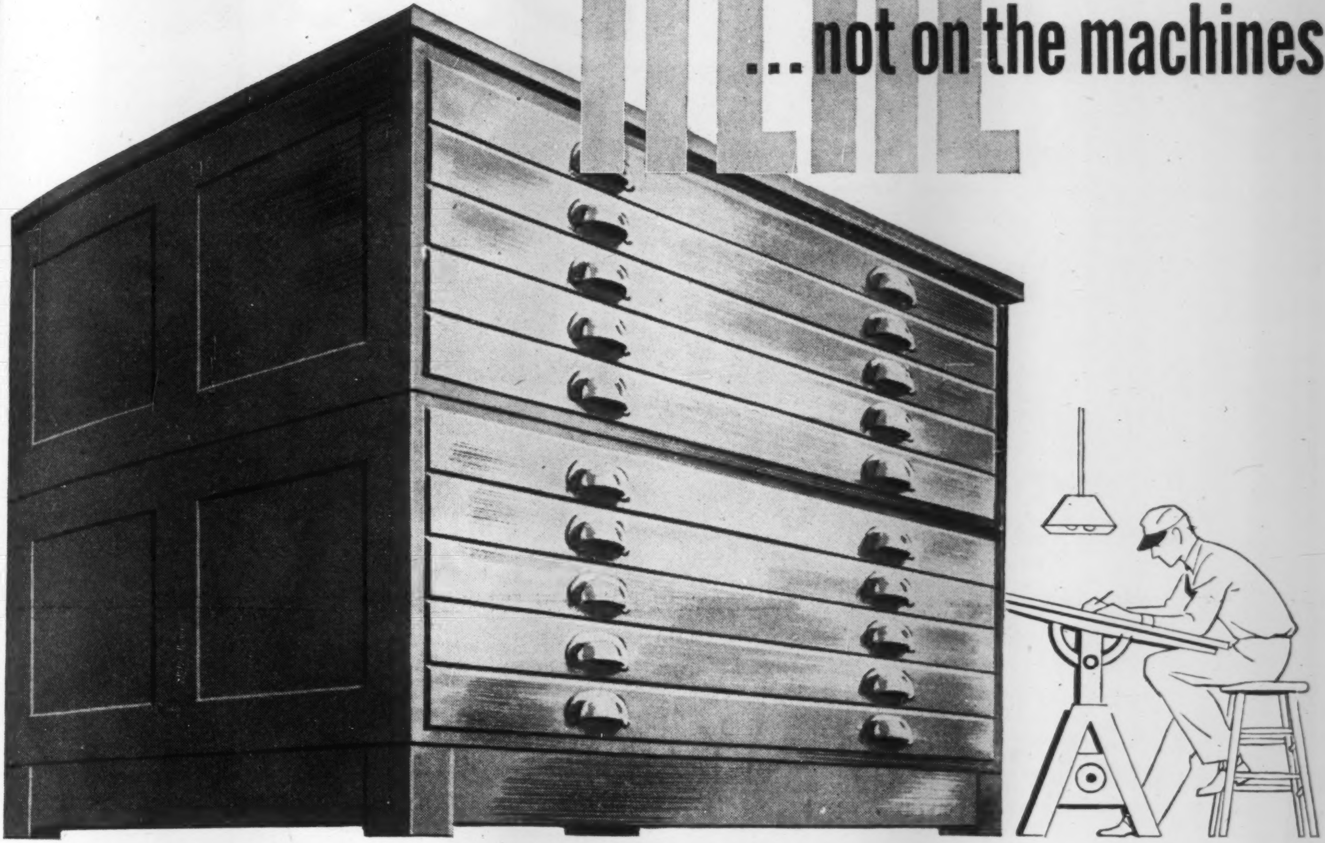
The two Hortonspheres shown above were installed at a chemical plant for the pressure storage of anhydrous ammonia. Designed for an operating pressure of 50 lb. per sq. in., these spheres reduce the amount of vaporization that takes place from the liquid ammonia. They have a capacity of 2,500 bbls. each.

Hortonspheres are being built for working pressures up to 100 lb. per sq. in. and in capacities up to 20,000 bbls. Write our nearest office for quotations.

CHICAGO BRIDGE & IRON COMPANY

Chicago 4.........2199 McCormick Bldg.
Cleveland 15.........2263 Guildhall Bldg.
New York 6....3395—165 Broadway Bldg.
Philadelphia 3.1652–1700 Walnut Street Bldg.
Washington 4..........703 Atlantic Bldg.
Houston 1............5628 Clinton Drive
Tulsa 3...............1647 Hunt Bldg.
Birmingham 1.........1596 N. 50th Street
San Francisco 5.........1084 Rialto Bldg.

Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PENNA. ***IN CANADA—HORTON STEEL WORKS LIMITED, FORT ERIE, ONT.***



Your originals belong HERE ...not on the machines

Pencil originals are precious, but even when they are new they often give unsatisfactory shop prints. When they are handled, they wear and blur. Prints made from them get cloudier still.

So use your pencil originals only once—to make PHOTACT Prints with *ink-intense* lines on PHOTACT Tracing Paper or Cloth.

Then make all the blueprints, blue or blackline prints or brownprint negatives you need from your PHOTACT Prints. They will be more legible than any made from the average pencil original.

For full information, write on your letterhead to PHOTACT Department, Keuffel & Esser Co., Hoboken, N. J.

PHOTACT
Reg. U. S. Pat. Off.
REPRODUCTION PAPERS AND CLOTHS

KEUFFEL & ESSER CO.
ESTABLISHED 1867

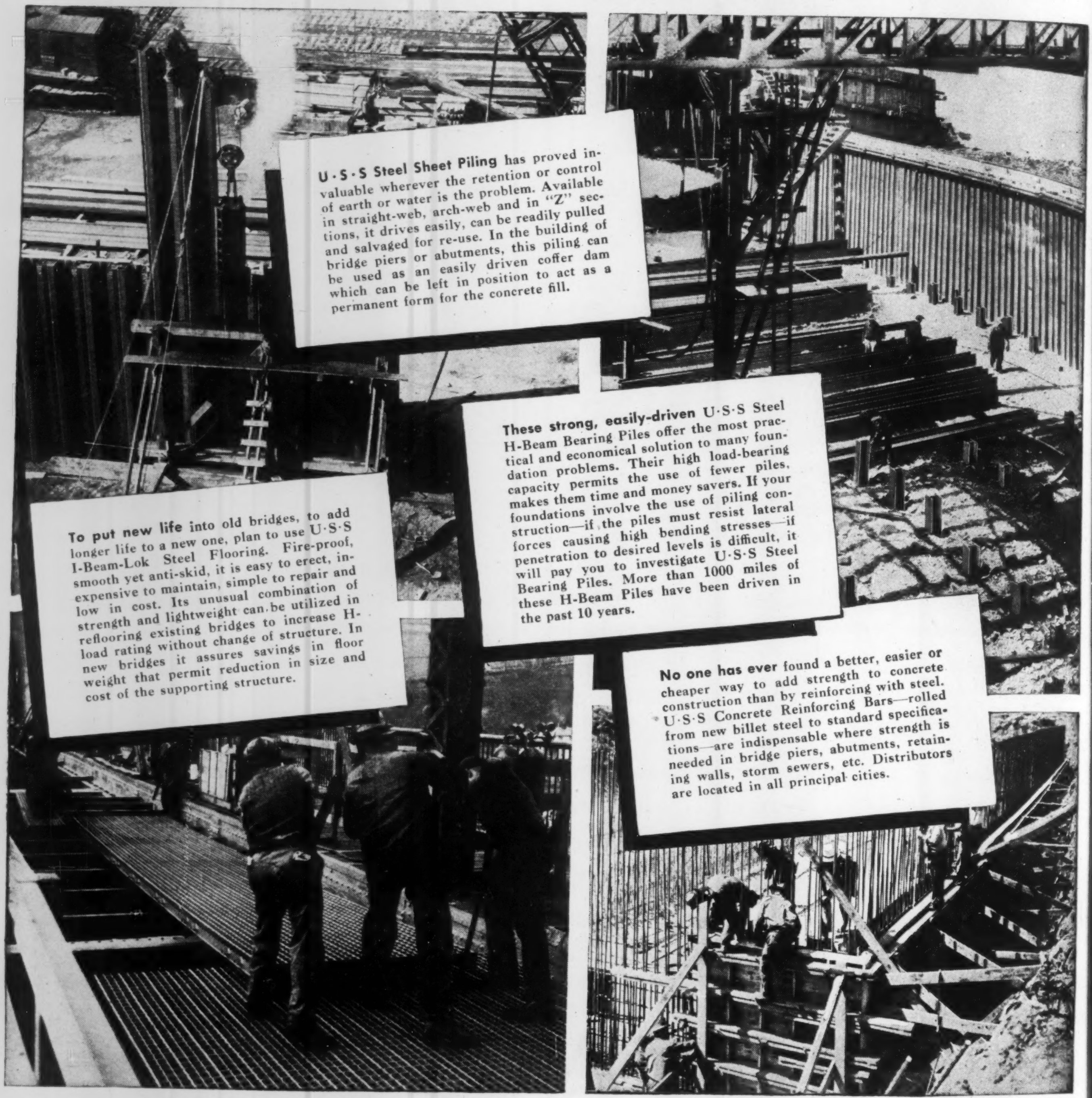
K+E
TRADE MARK

Drafting, Reproduction, Surveying Equipment and Materials.
Slide Rules. Measuring Tapes.

CHICAGO • DETROIT • ST. LOUIS • NEW YORK • HOBOKEN • SAN FRANCISCO • LOS ANGELES • MONTREAL

For safe, strong, and economical construction

NOTHING EQUALS *Steel!*



U·S·S Steel Sheet Piling has proved invaluable wherever the retention or control of earth or water is the problem. Available in straight-web, arch-web and in "Z" sections, it drives easily, can be readily pulled and salvaged for re-use. In the building of bridge piers or abutments, this piling can be used as an easily driven coffer dam which can be left in position to act as a permanent form for the concrete fill.

To put new life into old bridges, to add longer life to a new one, plan to use U·S·S I-Beam-Lok Steel Flooring. Fire-proof, smooth yet anti-skid, it is easy to erect, inexpensive to maintain, simple to repair and low in cost. Its unusual combination of strength and lightweight can be utilized in reflooring existing bridges to increase H-load rating without change of structure. In new bridges it assures savings in floor weight that permit reduction in size and cost of the supporting structure.

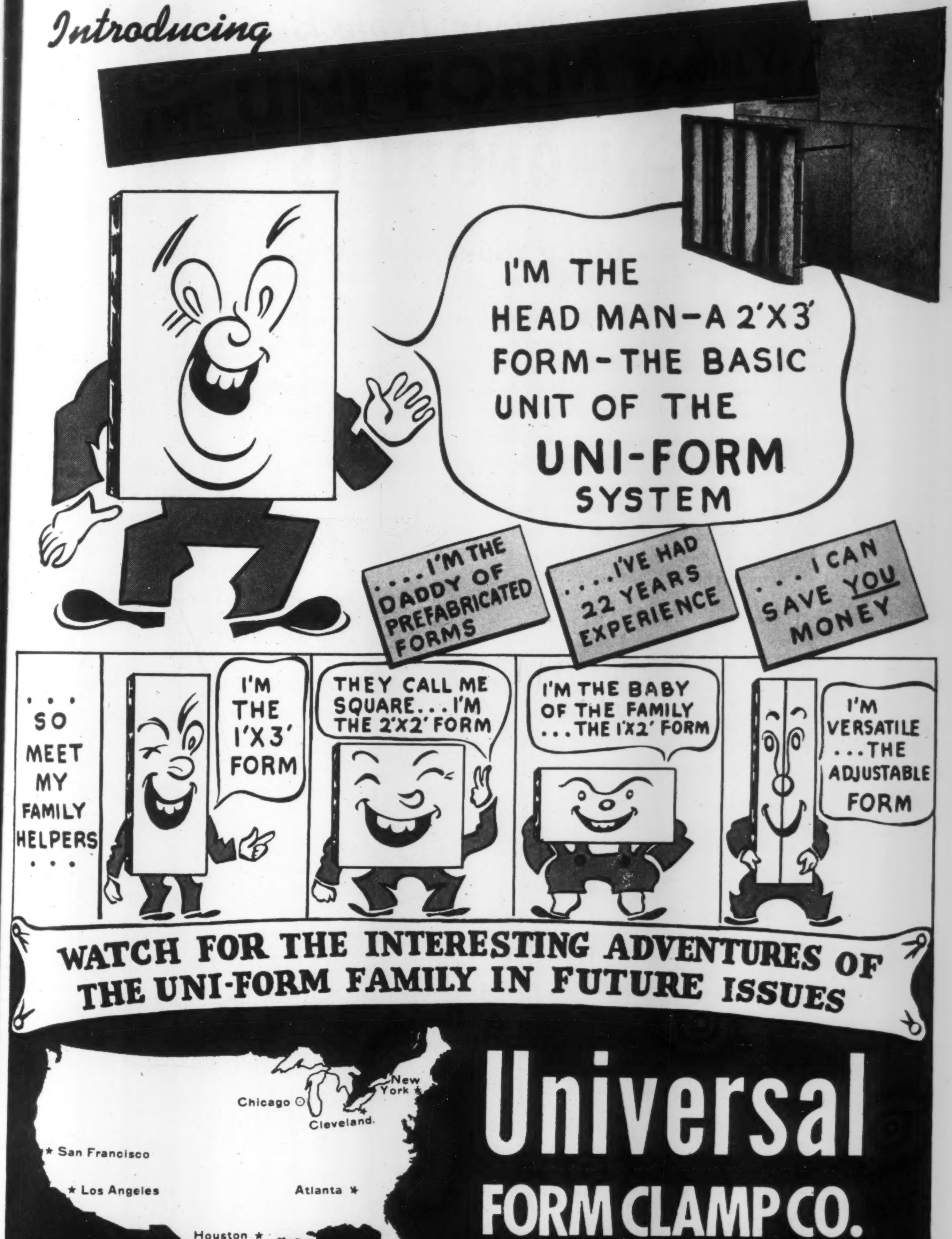
These strong, easily-driven U·S·S Steel H-Beam Bearing Piles offer the most practical and economical solution to many foundation problems. Their high load-bearing capacity permits the use of fewer piles, makes them time and money savers. If your foundations involve the use of piling construction—if the piles must resist lateral forces causing high bending stresses—if penetration to desired levels is difficult, it will pay you to investigate U·S·S Steel Bearing Piles. More than 1000 miles of these H-Beam Piles have been driven in the past 10 years.

No one has ever found a better, easier or cheaper way to add strength to concrete construction than by reinforcing with steel. U·S·S Concrete Reinforcing Bars—rolled from new billet steel to standard specifications—are indispensable where strength is needed in bridge piers, abutments, retaining walls, storm sewers, etc. Distributors are located in all principal cities.

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

USS

UNITED STATES STEEL
]

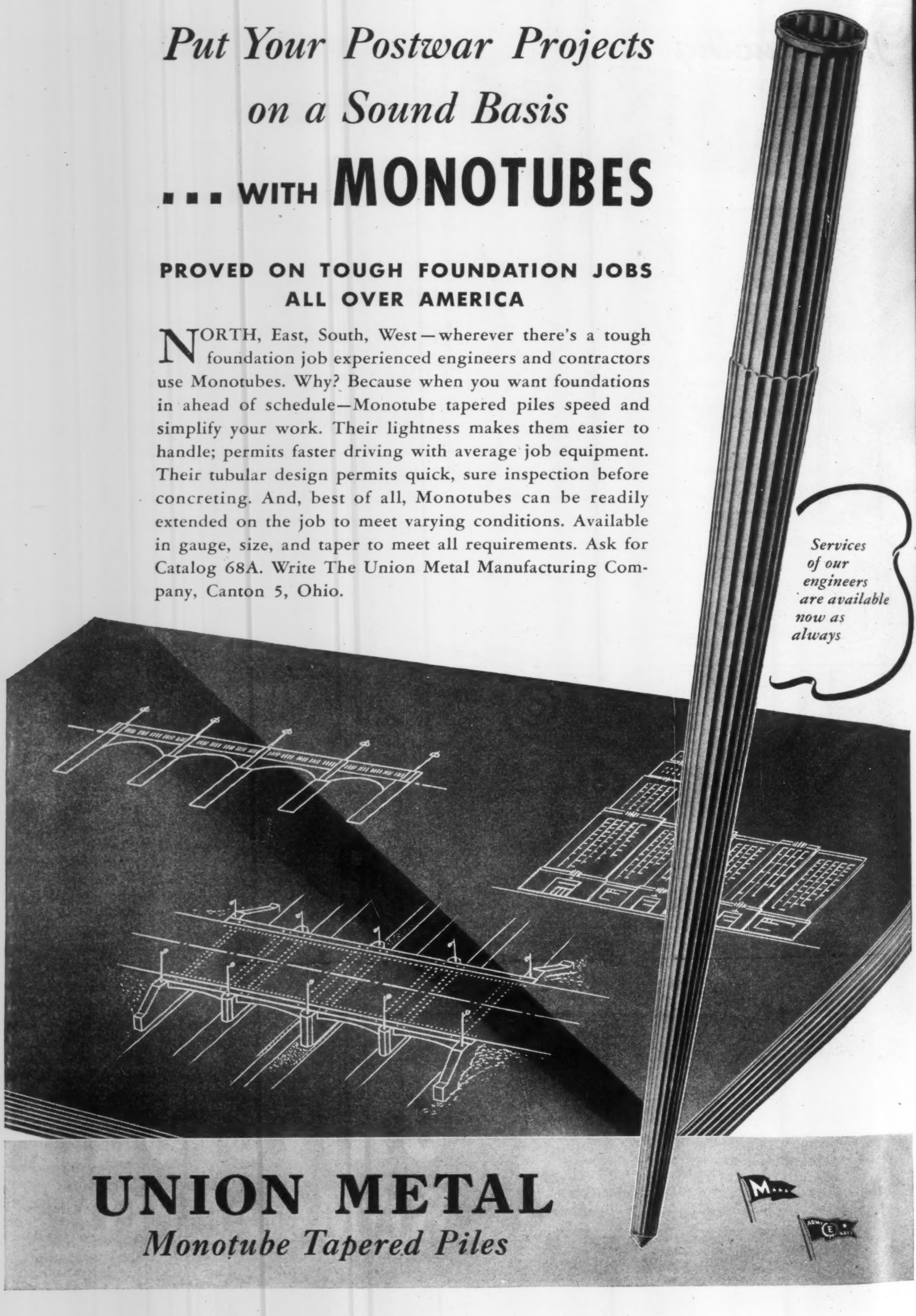

Introducing
THE UNI-FORM FAMILY
I'M THE HEAD MAN—A 2'X3' FORM—THE BASIC UNIT OF THE UNI-FORM SYSTEM
....I'M THE DADDY OF PREFABRICATED FORMS
....I'VE HAD 22 YEARS EXPERIENCE
...I CAN SAVE YOU MONEY
... SO MEET MY FAMILY HELPERS ...
I'M THE 1'X3' FORM
THEY CALL ME SQUARE... I'M THE 2'X2' FORM
I'M THE BABY OF THE FAMILY ...THE 1'X2' FORM
I'M VERSATILE ...THE ADJUSTABLE FORM
WATCH FOR THE INTERESTING ADVENTURES OF THE UNI-FORM FAMILY IN FUTURE ISSUES
New York
Chicago
Cleveland.
San Francisco
Los Angeles
Atlanta
Houston
Universal
FORM CLAMP CO.
1238 N. KOSTNER AVE., CHICAGO 51

Put Your Postwar Projects on a Sound Basis

. . . WITH MONOTUBES

PROVED ON TOUGH FOUNDATION JOBS ALL OVER AMERICA

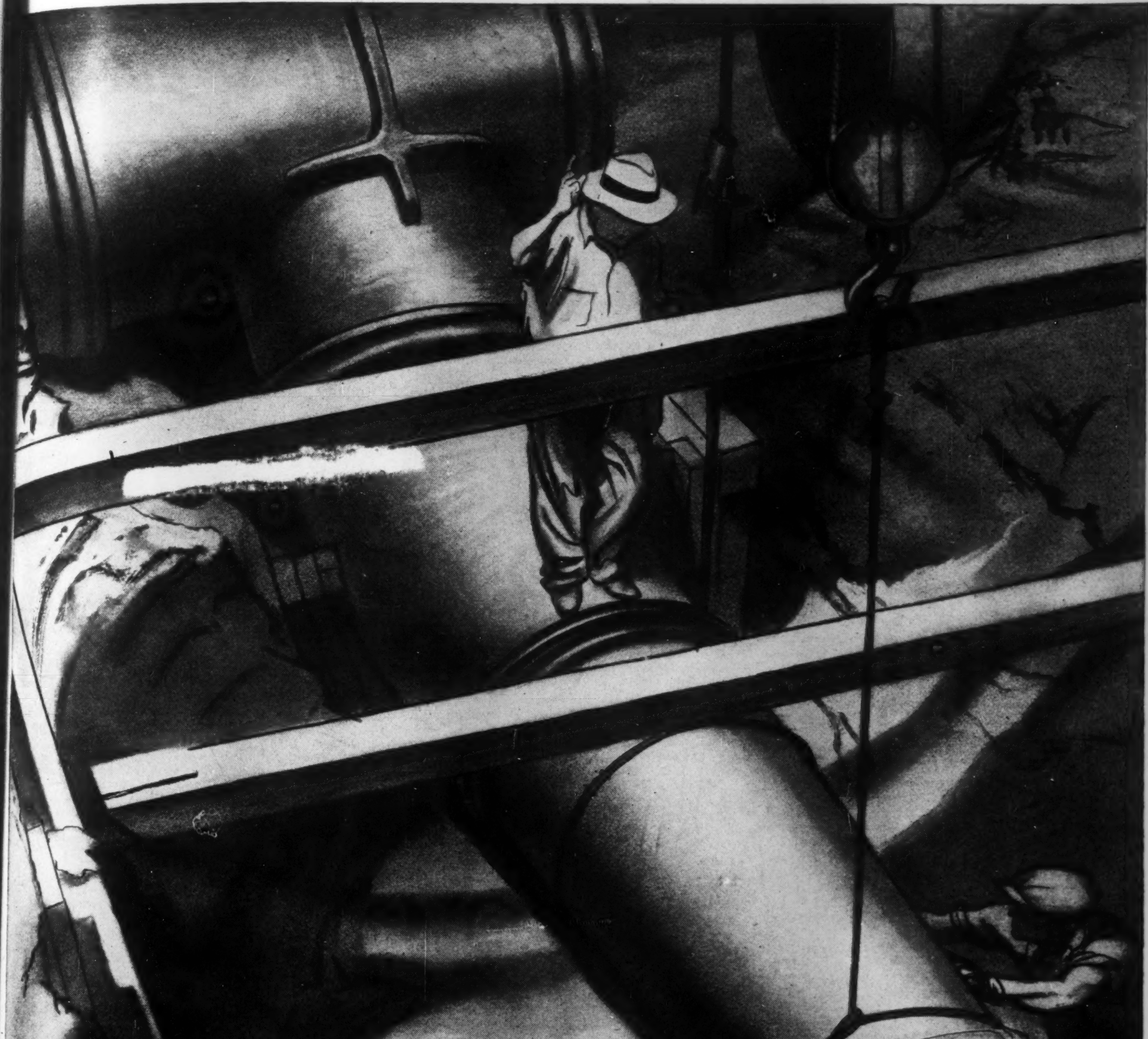
NORTH, East, South, West—wherever there's a tough foundation job experienced engineers and contractors use Monotubes. Why? Because when you want foundations in ahead of schedule—Monotube tapered piles speed and simplify your work. Their lightness makes them easier to handle; permits faster driving with average job equipment. Their tubular design permits quick, sure inspection before concreting. And, best of all, Monotubes can be readily extended on the job to meet varying conditions. Available in gauge, size, and taper to meet all requirements. Ask for Catalog 68A. Write The Union Metal Manufacturing Company, Canton 5, Ohio.



Services of our engineers are available now as always

UNION METAL

Monotube Tapered Piles



Large diameter fittings installed for pumping station.
Drawn by Rico Lebrun for U. S. Pipe & Foundry Co.

U.S.
cast iron
PIPE

U. S. PIPE & FOUNDRY CO.
General Offices: Burlington, N. J.
Plants and Sales Offices throughout the U. S. A.

If you have a problem in connection with the design of special fittings or castings we can help you. One plant specializing in the manufacture of fittings—special castings foundries at our other plants—a competent technical staff—and 44 years of experience—are at your service. Our equipment for casting and completely machining special castings in large sizes is exceptional and extensive.

Changes in Membership Grades

Additions, Transfers, Reinstatements, and Resignations

From October 10 to November 9, 1944, Inclusive

Additions to Membership

Adams, Clifford Edward (Jun. '44), Hydrodynamic Research Engr., National Advisory Committee for Aeronautics, Langley Field (Res., 740 E St., Copeland Park, Newport News), Va.

Adams, William Samuel (Jun. '44), Ensign, D-V(G), U.S.N.R., Care, Fleet Post Office, New York, N.Y.

Aitken, Frank William, Jr. (Jun. '44), Civ. Engr., W. D. Peugh & Associates, 333 Montgomery, San Francisco (Res., 66 Diane Lane, Larkspur), Calif.

Anderson, Harold Brother (M. '44), Eng. Analyst, Griffenhagen & Associates, 333 North Michigan Ave., Chicago (Res., 1003 Washington St., Evanston), Ill.

Barber, Kent (Jun. '44), Meridian, Idaho.

Baumann, Edward Robert (Jun. '44), Private, U.S. Army, Company A, 11th Battalion, Camp Wheeler, Ga.

Best, Ruth Evelyn (Miss) (Jun. '44), Draftsman, C.M.St.P. & P.R.R., Union Station (Res., 4915 Belle Plaine), Chicago 41, Ill.

Bienvenu, Maurice Emmanuel, Jr. (Jun. '44), Ensign, CEC, U.S.N.R.; St. Martinville, La.

Blake, Richard Edward (Jun. '44), Seaman, 1/c, R.T., U.S.N.; 2 Alvord St., Stratford, Conn.

Bogost, Meyer Samuel (Assoc. M. '44), Capt., San. Corps. U.S. Army, AAF RS 1., Convention Hall, Atlantic City, N.J.

Brockman, George Frederic (M. '44), Hydr. and San. Engr., U.S. Engr. Dept., Federal Bldg. (Res., 119 West St. Catherine St.), Louisville, Ky.

Brooks, John Albert (Jun. '44), Ensign, U.S.N.R.; 4211 Gilbert Ave., Dallas 4, Tex.

Brown, Robert Moore (Assoc. M. '44), Asst. Chf., Constr. Section, Dept. of Commerce, Civ. Aeronautics Administration, Section A 55, Washington 25, D.C.

Chan, Albert Jeung (Jun. '44), Collaborator, SCS, Dept. of Agri., Research Center, Beltsville (Res., 3705 Parkwood St., Cottage City), Md.

Colclesser, William Richard (Jun. '44), 3300 College Ave., Route 4, Terre Haute, Ind.

D'Angelo, Elmer Mauro (Jun. '44), 2d Lt., Field Artillery Reserve, U.S. Army; 882 Schiele Ave., San Jose, Calif.

Epstein, Philip (Jun. '44), Private, U.S. Army; 316 Rogers Ave., Brooklyn 25, N.Y.

Evans, Henry Alan (Assoc. M. '44), Asst. Hydr. Engr., TVA, 615 Union Bldg. (Res., 3436 Ashland Ave.), Knoxville, Tenn.

Farrow, Verle (Jun. '44), 2d Lt., San. Corps, U.S. Army, 20th Medical Inspectors Class, Carlisle Barracks, Pa.

Fetzer, Claude Anderson (Jun. '44), Ensign, U.S.N.R., Charleston, Tenn.

Fisk, Chester Clarke (M. '44), Prin. Field Representative, U.S. Bureau of the Budget, 593 Market St., San Francisco (Res., 921 Euclid Ave., Berkeley), Calif.

Foerster, Richard Earl (Jun. '44), Technical Service Representative, Goodyear Tire & Rubber Co., 1144 East Market (Res., 567 Fernwood Drive), Akron 2, Ohio.

Fredrick, Theodore Carl (M. '44), Vice-Pres., DeLeuw, Cather & Co., 20 North Wacker Drive, Chicago 6, Ill.

Freitag, Paul Walter David, Jr. (Jun. '44), Eng. Trainee, Eng. Staff, Goodyear Tire and Rubber Co. (Res., 77 North Highland Ave.), Akron 3, Ohio.

Giordano, Mario (Jun. '44), Seaman 2/c, U.S.N.; 1331 Beach Ave., New York 61, N.Y.

Goffin, George Robert (Assoc. M. '44), Deputy Chf. Engr., Water Supply and Sewerage, Brisbane City Council, City Hall, Brisbane, Queensland, Australia.

Goslin, Ival Vinton (Jun. '44), Asst. Engr., U.S. Geological Survey, Box 413, Logan, Utah.

Goss, Cadmus Levi Gordon (Jun. '44), Calculator, Taylor & Taylor, 526 South Spring St. (Res., 2715 Portland St.), Los Angeles, Calif.

Granquist, John Edlov (Assoc. M. '44), Associate Structural Engr., U.S. Engrs., Textile Tower (Res., 5215 Twentieth, South), Seattle 8, Wash.

Green, Carl Martin (Jun. '44), 2d Lt., Medical Administrative Corps, U.S. Army; 43 West Hill, West Hartford, Conn.

Gregorowicz, Bronislaw (Assoc. M. '44), 1427 Kennelworth Pl., New York 61, N.Y.

Harlin, Richard Eddy (Jun. '44), With U.S.N.; 932 Elm Ave., Salt Lake City, Utah.

Heffernan, Richard Patrick (Jun. '44), With Army Air Corps, U.S. Army; 36 Arbella St., Salem, Mass.

Hensing, Emmett Henry (Assoc. M. '44), Associate Materials Engr., TVA, 613 Empire Bldg., Knoxville, Tenn.

Hernandez, Alberto (M. '44), Director, Public Works, Government of the Capital, San Juan, Puerto Rico.

Hoegg, Maximo (Jun. '44), Civ. Engr., Roberto Hoegg & Co., 2^a Ave., Sur No. 2, Guatemala City, Guatemala.

Hoffmann, Clinton Kelly (Assoc. M. '44), Senior Design Engr., Commonwealth of Kentucky, Dept. of Highways, Frankfort (Res., 330 Aylesford Pl., Lexington), Ky.

Horne, William Guilford, Jr. (Assoc. M. '44), Batten & Horne, 617 West Bldg. (Res., 4315 Yupon), Houston, Tex.

Howard, Elkins Mason (Assoc. M. '44), 1st Lt., Corps of Engrs., U.S. Army; 120 East 59th St., Savannah, Ga.

Kalajian, Harry (Jun. '44), Asst. Engr. to Plant Engr., Western Elec. Co., Inc., 100 Central Ave., Kearny (Res., 316 Fifty-Ninth St., West New York), N.J.

Latham, Fayette Mauzy, Jr. (Jun. '44), Party Chf. (Land Surveys and Civ. Eng.), John Roy McCrone, Jr., 12 Church Circle, Annapolis, Md.

Layson, John Don (Jun. '44), Director, Laboratory and Food Products Control, Flotill Products, Inc. (Res., 1710 North El Dorado St.), Stockton, Calif.

Leebov, Nathan (Assoc. M. '44), Design Engr., Blaw-Knox Co., Box 1198 (Res., 6364 Phillips Ave.), Pittsburgh 17, Pa.

Leps, Thomas MacMaster (Assoc. M. '44), Lt. (jg), CEC, U.S.N.R., Care, Fleet Post Office, San Francisco, Calif.

Lochner, Harry William (M. '44), Mgr., H. W. Lochner & Co., 160 North La Salle St., Chicago 3, Ill.

McCall, James Lyons, Jr. (Assoc. M. '44), Engr. (Soils Mechanics), U.S. Engr. Office, Soils and Concrete Laboratory, Vicksburg, Miss.

McGregor, Byron Empey (Jun. '44), Insp., Eng. Dept., Municipal Bldg. (Res., 2912 Adams Ave.), Ogden, Utah.

McMyler, Safford William (Jun. '44), Ensign, U.S.N.R.; 28 East Fleming Ave., Fort Wayne, Ind.

Mans, Albert Thomas (Jun. '44), Stress Analyst, Otis Elevator Co., 260 Eleventh Ave., New York, N.Y. (Res., 85 Jordan Ave., Jersey City, N.J.)

Martinez, Danilo (Jun. '44), 901 Exposition Blvd., Los Angeles 7, Calif.

Messina, Richard Frank (Assoc. M. '44), Sales Engr. (Wm. F. Surgi Equipment Co.), 1017 Magazine St., New Orleans 13, La.

Mollick, Joseph Nicholas (Jun. '44), 2d Lt., Air Corps, U.S. Army; 2109 North Lawrence St., Philadelphia, Pa.

Moor, Herman Lowrey (Assoc. M. '44), Civ. Engr., U.S. Engr. Office, Box 59, Louisville, Ky. (Res., 415 Meigs Ave., Jeffersonville, Ind.)

Murphy, Francis Joseph (Jun. '44), Lt., U.S. Army; 90 Justin Drive, San Francisco, Calif.

Newman, Donald M. (Jun. '44), Asst. Highway Engr., State Highway Dept., Smith St., Perth Amboy (Res., 1823 Greenwood Terrace, Belmar), N.J.

Noland, Martin Davis, Jr. (Jun. '44), Instrumentman, Black & Veatch, 4706 Broadway, Kansas City, Mo. (Res., 226 North Clifton, Wichita 8, Kans.)

Nuetzel, Hans (Jun. '44), Junior Highway Engr., State Div. of Highways, 808 State Bldg. (Res., 426 Isabel St.), Los Angeles 31, Calif.

O'Hare, Maurice William (Jun. '44), Draftsman, Ford, Bacon & Davis, 39 Broadway, New York (Res., 77 Broadway, Valley Stream), N.Y.

Olsen, Lyman Emanuel (Assoc. M. '44), Dist. Engr., City of Cooperative Projects, State Div. of Highways, Box 1352, Fresno 15, Calif.

Prusi, George Armas (Jun. '44), Major Engr., Boeing Aircraft Co. (Res., 532 Fourteenth Ave., North), Seattle 2, Wash.

Robbins, Richard Marshall (Jun. '44), Ensign, U.S.N.R.; 1724 Mt. Diablo, Stockton, Calif.

Rose, Elwood Thomas (Assoc. M. '44), Squad Leader, State Highway Dept. (Res., 104 Mountain St.), Carson City, Nev.

Samelson, Harold (Jun. '44), Asst. Research Engr., Armour Research Foundation, 33d Federal and Dearborn Sts. (Res., 4170 Drexel Blvd.), Chicago, Ill.

Sandberg, William Andrew (M. '44), Chf. Engr., Lacy Mfg. Co., 973 North Main St. (Res., 4173 West 5th St.), Los Angeles 5, Calif.

Schlemmer, Frederick Charles (M. '44), Project Mgr., TVA, Fontana Dam, N.C.

Slater, Murray Herbert (Jun. '44), Ensign, U.S.N.R., Care, Fleet Post Office, San Francisco, Calif.

Soifer, Herman (Jun. '44), Private, U.S. Army; 321 Eastern Parkway, Brooklyn 16, N.Y.

Speedie, Milton George (Assoc. M. '44), Designing Engr., Earth Dams, State Rivers and Water Supply Comm., Treasury Gardens, Melbourne, Victoria, Australia.

Spiller, Hollis Barclay (Jun. '44), Lt., CEC, U.S.N.R., ABATU, Lido Beach, N.Y.

Spitzer, Elroy Francis (Jun. '44), Ensign, CEC, U.S.N.R.; 6915 Seventh Ave., Kenosha, Wis.

Stanley, Owen Garrett, Jr. (Assoc. M. '44), Associate Engr., U.S. Engr. Office, 1209 Eighth St. (Res., 3800 Thirty-ninth St.), Sacramento 17, Calif.

Steffey, Dale Ethelbert (Jun. '44), Civ. Engr., P-1, Naval Ordnance Laboratory, Torpedo Station Annex, Bldg. 102 (Res., 41 Green St.), Newport, R.I.

Sterngold, Hyman (Jun. '44), Ensign, CEC, U.S.N.R.; 1620 Gladstone, Detroit 6, Mich.

Teagle, Charles Ray (Jun. '44), Lt., Corps of Engrs., U.S. Army; 1619 East Lakeview Ave., Pensacola, Fla.

Thorin, Nils Arthur (M. '44), Structural Engr., Eastman Kodak Co., Kodak Park (Res., Hotel Powers), Rochester, N.Y.

Tozzer, Jack Carl (Jun. '44), With U.S.N.R.; 235 Clover Ave., Marion, Ohio.

Turner, James Rogers, Jr. (Jun. '44), Lt. (jg), U.S.N.R., Michigan Union, Ann Arbor, Mich.

Visentin, Frank Louis (Jun. '44), Senior Designing Draftsman, Gibbs & Cox, Inc., 21 West St., New York (Res., 21-51 Twenty-Seventh St., Astoria 5), N.Y.

Wangen, Bruce Ollie (Jun. '44), Pvt., Signal Corps, U.S. Army; 828 Washington, Traverse City, Mich.

Whitmore, Morris Towar (M. '44), Lt. Col., Corps of Engrs., U.S. Army, Army Post Office 350, Care, Postmaster, New York, N.Y.

Williams, Gene Ellis (Jun. '44), With U.S. Army; Route 1, West Des Moines, Iowa.

Williges, John Anthony (Jun. '44), Engr., Hamilton & Williges, Bank of Commerce Bldg., Oakland (Res., 15 Crescent Ave., San Francisco 10), Calif.

Winter, Paul Hugo (Jun. '44), Ensign, CEC, U.S.N.R., Bachelor Officers Quarters O2, Naval Constr. Training Center, Davisville, R.I.

Membership Transfers

Branch, William Martin (Jun. '33; Assoc. M. '44), Capt., U.S. Army, State Dept. of Public Health, 12 Capitol Sq., Atlanta 3, Ga.

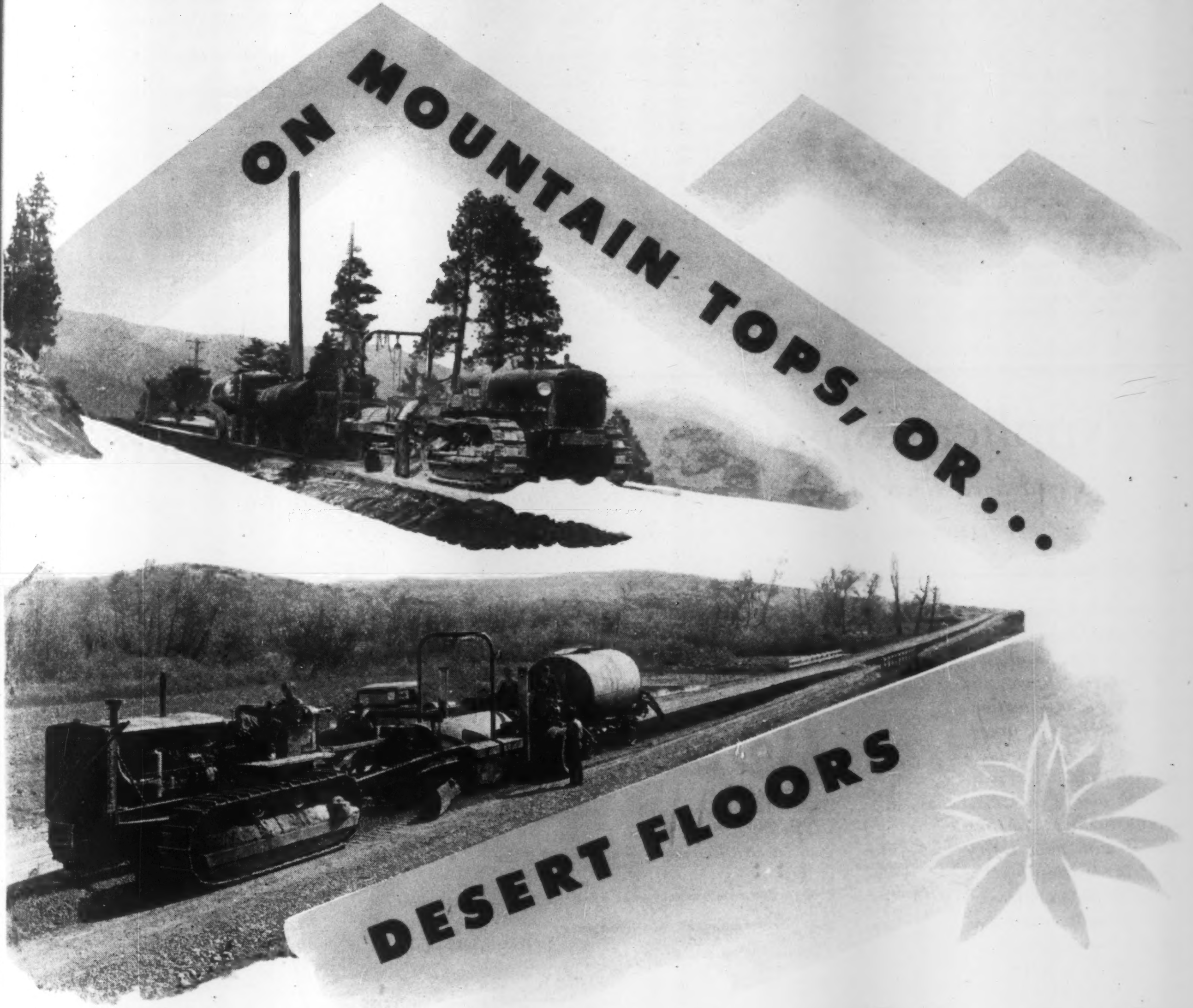
Dyer, Arthur James (Assoc. M. '01; M. '03; Hon. M. '44), Chairman of Board, Nashville Bridge Co., Nashville, Tenn.

Finke, Ralph William (Jun. '27; Assoc. M. '32; M. '44), Bridge Engr., State Dept. of

TOTAL MEMBERSHIP AS OF NOVEMBER 9, 1944

Members	6,162
Associate Members	7,649
Corporate Members	13,811
Honorary Members	37
Juniors	6,373
Affiliates	77
Fellows	1
Total	20,299
(November 9, 1943	19,277)

ECONOMY MUST BECOME THE NATIONAL WATCHWORD!



WOOD ROADMIXERS make paving dollars *go farther!*

The Wood Roadmixer is the pioneer and leading travel plant method of rapid, low-cost, high-quality pavement construction. As a traveling mixing plant, it uses low-cost native and local materials, cutting hauling costs to a minimum and saving equipment and labor. Because it handles emulsions, road oils or soil cement, it offers unmatched flexibility in choice of materials and methods. In addition, the Wood Roadmixer produces as high as 2,000 tons of mix per 8-hour day in *one pass.*

More than 100,000,000 square yards of Wood Roadmixer paving in this country and abroad are giving top service under every traffic and climate condition with negligible maintenance costs.

That's why Wood Roadmixers make highway and airport *dollars go farther!* And that's why you should get all the facts about the Wood Roadmixer—a complete traveling mixing plant. Sold by leading equipment dealers everywhere. For literature and prices see your Wood Roadmixer dealer or write direct.

DESIGN FOR ROAD-MIX WOOD ROADMIXER

Wood Manufacturing Co. • 816 West 5th St., Los Angeles 13, California

Highways, Transportation Bldg. (Res., 530 O'Farrell Ave.), Olympia, Wash.

Flanagan, William Edward (Affiliate '40; M. '44), Director, Maritime Div., Smaller War Plants Corp. (U.T.), H.O.L.C. Bldg. (Res., 2141 Eye St., N.W.), Washington, D.C.

Frazier, John Warren (Jun. '35; Assoc. M. '44), Civ. Engr. II, Grade D, Bridge Dept., State Highway Comm., Masonic Temple Bldg. (Res., 1150 Warren Ave.), Topeka, Kans.

Ganick, Saul Samuel (Jun. '40; Assoc. M. '44), Senior Engr., U.S. Engrs., 75 Federal St., Boston 10, Mass.

Gross, Charles Philip (M. '28; Hon. M. '44), Maj. Gen., Corps of Engrs., U.S. Army, Fort Myer, Va.

Hartmann, Ernest Christian (Jun. '27; Assoc. M. '35; M. '44), Chf., Eng. Design Div., Aluminum Co. of America, Aluminum Research Laboratories, Box 772, New Kensington, Pa.

Khalifa, Mohamed Kamal (Jun. '38); Assoc. M. '44), Senior Research Engr., Faculty of Eng., Fouad 1st Univ., Giza, Egypt.

King, Horace Williams (M. '13; Hon. M. '44), Prof. Emeritus, Hildene Manor, Ann Arbor, Mich.

Larsen, Herman (Assoc. M. '23; M. '44), Chf. Engr., Uvalde Constr. Co., 2400 Uvalde St. (Res., 4516 Fairfax Ave.), Dallas 5, Tex.

Lassiter, Richard Thornton Yardley (Jun. '25; Assoc. M. '30; M. '44), Secy., Southern Aggregates Corp., Capitol Club Bldg. (Res., 2814 Exeter Circle), Raleigh, N.C.

Sabin, Louis Carlton (Assoc. M. '93; M. '02; Hon. M. '44), Vice-Pres., Lake Carriers Assn., 905 Rockefeller Bldg., Cleveland, Ohio.

Shirley, John Phelan, Jr. (Assoc. M. '36; M. '44), Gunther and Shirley Co., 714 West Olympic Blvd., Los Angeles, Calif.

Smith, Frederick Anderson (Jun. '32; Assoc. M. '44), With Planning Board, Albany Felt Co., 1333 Broadway, Albany (Res., 48 Delmar Pl., Delmar), N.Y.

Stanley, Randolph Lee (Jun. '37; Assoc. M. '44), 1st Lt., Corps of Engrs., U.S. Army; 1710 Forty-Sixth Ave., San Francisco, Calif.

Stroyan, Robert (Jun. '32; Assoc. M. '44), Engr., Clinton Engr. Works (Res., 20 Florence St., Meadow Hills), Knoxville, Tenn.

Surveyer, Arthur (M. '24; Hon. M. '44), Cons. Engr., Arthur Surveyer & Co., Room 1203, Dominion Sq. Bldg., Montreal, Que., Canada.

REINSTATEMENTS

Bell, Rodney Linton, M., reinstated Nov. 9, 1944.

Jongh, Arthur Francis de., Assoc. M., reinstated Oct. 10, 1944.

Damon, Henry Gilroy, Assoc. M., reinstated Oct. 25, 1944.

Gohmann, Herbert Raymond, Jr., Jun., reinstated Oct. 21, 1944.

Griswold, William Sheridan, Jun., reinstated Oct. 7, 1944.

Valenstein, Samuel, M., reinstated Oct. 13, 1944.

RESIGNATIONS

Hansen, Philip Charles, Jun., resigned Oct. 23, 1944.

Jewett, Richard Lee, Jun., resigned Oct. 11, 1944.

Katkoria, Chhabildad Rughunathji, Assoc. M., resigned Oct. 31, 1944.

Applications for Admission or Transfer

Condensed Records to Facilitate Comment from Members to Board of Direction

DECEMBER 1, 1944

NUMBER 12

The Constitution provides that the Board of Direction shall elect or reject all applicants for admission or for transfer. In order to determine justly the eligibility of each candidate, the Board must depend largely upon the membership for information.

Every member is urged, therefore, to scan carefully the list of candidates published each month in CIVIL ENGINEERING *and to furnish the Board with data which may aid in determining the eligibility of any applicant.*

It is especially urged that a definite recommendation as to the proper grading be given in each case, inasmuch as the grading must be based upon the opinions of those who know the applicant personally as well as upon the nature and extent of his professional experience. Any facts derogatory to the personal character or professional reputation of an applicant should be promptly communicated to the Board.

Communications relating to applicants are considered strictly confidential.

The Board of Direction will not consider the applications herein contained from residents of North America until the expiration of 30 days, and from non-residents of North America until the expiration of 90 days from the date of this list.

MINIMUM REQUIREMENTS FOR ADMISSION

GRADE	GENERAL REQUIREMENT	AGE	LENGTH OF ACTIVE PRACTICE	RESPONSIBLE CHARGE OF WORK
Member	Qualified to design as well as to direct important work	35 years	12 years	5 years RCM*
Associate Member	Qualified to direct work	27 years	8 years	1 year RCA*
Junior	Qualified for subprofessional work	20 years	4 years	
Affiliate	Qualified by scientific acquirements or practical experience to cooperate with engineers	35 years	12 years	5 years RCM*

* In the following list RCA (responsible charge—Associate Member standard) denotes years of responsible charge of work as principal or subordinate, and RCM (responsible charge—Member standard) denotes years of responsible charge of IMPORTANT work, i.e., work of considerable magnitude or considerable complexity.

APPLYING FOR MEMBER

Abelard, Aaron Raymond, Santa Fe, N.Mex. (Age 37) (Claims RCA 4.3 RCM 7.0) Oct. 1930 to date (intermittently) with New Mexico Highway Dept., since Nov. 1937 as State Mgr., Highway Planning Survey.

Altman, Richard (Assoc. M.), Detroit, Mich. (Age 40) (Claims RCA 8.3 RCM 5.5) June 1942 to date with Corps of Engrs., U.S. Army, at present as Major; previously with U.S. Engr. Office, Los Angeles, Calif.

Barker, Stanley Truman (Assoc. M.), Lima, Peru. (Age 49) (Claims RCA 14.4 RCM 8.3) Nov. 1940 to date with USNR, since June 1943 as Capt. (CEC), being Director of Constr., Div. of Peruvian Air Force.

Bluestein, Ed, Atlanta, Tex. (Age 44) (Claims RCA 9.5 RCM 8.4) Aug. 1926 to date with Texas Highway Dept., since July 1941 as Dist. Engr.

Bonet y Guilayn, Jose, Caracas, Venezuela. (Age 53) (Claims RCA 11.3 RCM 13.9) Oct. 1941 to date Engr. with Edgar Pardo Stolk, Cons. Engr., Pardo, Proctor, Freeman & Meuser, Cons. Engrs., Caracas, Venezuela; previously Lt. Col., Corps of Engrs., Army of Spanish Republic.

Briggs, Chauncey Millar, Chicago, Ill. (Age 61) (Claims RCA 11.0 RCM 19.8) July 1921 to date in private practice as Cons. Engr. (Briggs & Almy, Cons. Engrs., and C. M. Briggs, Cons. Engr.); Jan. 1942 to date also Structural Designer, Dept. of Public Works, Bureau of Eng., Div. of Water-Works Design, Chicago.

Bruckmann, Hugo Christian, Paisley, Renfrewshire, Scotland. (Age 59) (Claims RCA 9.0 RCM 26.2) June 1939 to date with Thomas White & Sons, Ltd., Eng. Works, Paisley, as Designer.

Buckner, Floyd King, Dallas, Tex. (Age 42) (Claims RCA 12.8 RCM 8.0) Oct. 1925 to date Estimating Engr., Project Mgr., etc. for P. O'B. Montgomery, Bldrs. and Engineers., Dallas.

Catchings, William Baird, Washington, D.C. (Age 53) (Claims RCM 21.0) 1943 to date with War Dept., Eng. Div., Grounds and Runways Branch; previously Chf. Airport Paving, Drainage and Grading Engr., Florida-Pan American Airways, Inc., Miami, Florida; with Civ. Aeronautics Administration Senior Airports Engr.

Clark, Simeon Coleman, San Benito, Tex. (Age 39) (Claims RCA 7.9 RCM 8.8) Feb. 1928 to date with Central Power & Light Co., San Benito, since Jan. 1938 as Dist. Water Supervisor.

Copeland, Kern Hadley, San Diego 15, Calif. (Age 51) (Claims RCM 26.5) July 1917 to date with U.S. Army, since June 1941 as Major, San. Corps, being Post Medical Inspector, Fort Rosecrans, Calif.

Fairfield, Guy Moore, Alton, Ill. (Age 55) (Claims RCA 9.5 RCM 13.8) 1941 to date Constr. Engr., FWA, Chicago, Region IV; previously Constr. Engr. and Engr. Examiner, PWA.

Foster, Norman (Assoc. M.), Sharon Hill, Pa. (Age 56) (Claims RC 38.0 D 27.0) 1917 to date member of firm, Damon & Foster, Civ. and Cons. Engrs.; also Boro Engr. for various boroughs and (since 1936) Township Engr. for 6 townships.

Gale, Samuel Hawes, Albuquerque, N.Mex. (Age 41) (Claims RCA 6.8 RCM 11.6) April 1925 to date with U.S. Engr. Office, since Jan. 1942 as Senior Engr., being Chf. of Flood Control Sec., Albuquerque, N.Mex.

Gavenman, Jacob David, Webster Groves, Mo. (Age 50) (Claims RCA 2.0 RCM 14.6) May 1942 to date with Defense Plant Corporation since Aug. 1944 as Div. Engr.; previously Engr. Inspector, PWA, Nebraska.

Geib, George Albert, Washington, D.C. (Age 56) (Claims RCA 5.4 RCM 17.0) 1943 to date Management and Cons. Engr., Office of Chf. Engr.; previously Lt. Col., Corps of Engrs., Civil Affairs, Graduate School of Mil. Govt., Charlottesville, Va.; with FWA.

Harding, Edward Crittenden (Assoc. M.), Cincinnati, Ohio. (Age 52) (Claims RCA 17.6 RCM 12.9) Aug. 1939 to date Vice-Pres. and Chf. Engr., Western Waterproofing Co., Cincinnati; previously with PWA.

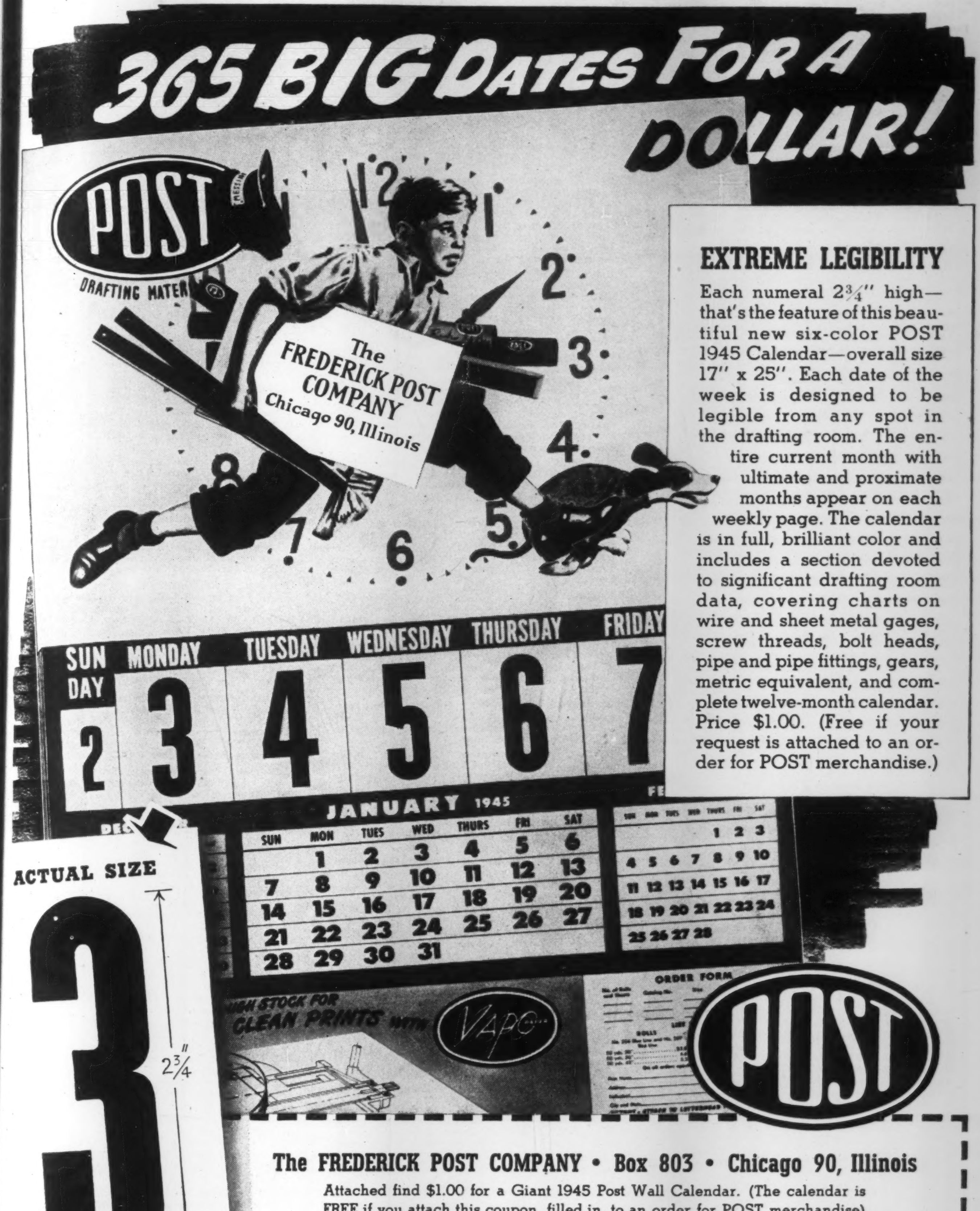
Hart, Willard Harry, Milwaukee, Wis. (Age 42) (Claims RCA 9.8 RCM 7.2) Sept. 1944 to date with American Inst. of Steel Constr., Inc.; previously with Portland Cement Association; with Bridge Dept., Wisconsin Highway Comm.

Howe, Wistar Clifford, Mt. Holly, N.C. (Age 43) (Claims RCA 7.4 RCM 5.7) July 1944 to date Asst. Res. Engr., Constr. Dept., Duke Power Co.; May 1941 to June 1944 with Corps of Engrs., U.S. Army, as Capt. and (after Aug. 1942) Major; previously with Duke Power Co.; with TVA.

Jones, Lawrence Brenton, Dallas, Tex. (Age 42) (Claims RCM 9.5) 1919 to date with Mosher Steel Co., Dallas and Houston, since 1943 as Secy. and Treas.

Jones, Spencer Ainsworth, New York City. (Age 54) (Claims RCM 12.0) 1938 to date Cons. Engr.; previously Designer and Supt. of Constr. with C. G. Jones, Archt., New York City.

Lang, Conrad Henry (Assoc. M.), Troy, N.Y. (Age 38) (Claims RCA 5.0 RCM 6.3) Jan. 1928 to date with New York State Dept. of



365 BIG DATES FOR A DOLLAR!
POST
DRAFTING MATERIALS
The FREDERICK POST COMPANY Chicago 90, Illinois
SUNDAY 2
MONDAY 3
TUESDAY 4
WEDNESDAY 5
THURSDAY 6
FRIDAY 7
JANUARY 1945
HIGH STOCK FOR CLEAN PRINTS with VAPO
ORDER FORM
ACTUAL SIZE
3
2¾"
POST

EXTREME LEGIBILITY

Each numeral 2¾" high—that's the feature of this beautiful new six-color POST 1945 Calendar—overall size 17" x 25". Each date of the week is designed to be legible from any spot in the drafting room. The entire current month with ultimate and proximate months appear on each weekly page. The calendar is in full, brilliant color and includes a section devoted to significant drafting room data, covering charts on wire and sheet metal gages, screw threads, bolt heads, pipe and pipe fittings, gears, metric equivalent, and complete twelve-month calendar. Price $1.00. (Free if your request is attached to an order for POST merchandise.)

The FREDERICK POST COMPANY • Box 803 • Chicago 90, Illinois

Attached find $1.00 for a Giant 1945 Post Wall Calendar. (The calendar is FREE if you attach this coupon, filled in, to an order for POST merchandise)

NAME ______ COMPANY ______

ADDRESS ______ CITY & STATE ______

Public Works, since Jan. 1941 as Senior Grade Separation Engr.

Long, Edward Crawford, Savannah, Ga. (Age 64) (Claims RCM 33.3) Sept. 1938 to date Structural Engr., The Steel Products Co., Inc., Savannah.

McCright, Boyd Grant, Cincinnati, Ohio. (Age 43) (Claims RCA 14.1 RCM 5.4) Dec. 1942 to date with USNR, since April 1943 overseas; previously with City of Cincinnati, Ohio.

Mehta, Ramesh Sumant (Assoc. M.), Bhavanagar, India. (Age 38) (Claims RCA 2.5 RCM 8.4) June 1936 to Aug. 1944 Drainage Engr., Public Works Dept., Bhavanagar; Aug. 1944 to date Project Engr. in charge of postwar reconstruction schemes in State.

Montgomery, Jay Gordon, Minneapolis, Minn. (Age 52) (Claims RCA 10.2 RCM 6.9) Jan. 1930 to date with Winston Bros. Co., Minneapolis, Minn.

Owen, Mark Blynn (Assoc. M.), Hastings-on-Hudson, N.Y. (Age 50) (Claims RCA 9.2 RCM 8.6) April 1944 to date Director, Comm. on Postwar Constr., Am. Soc. C.E.; previously Vice-Pres. and Director, Nichols Eng. & Research Corporation, New York City.

Peek, Gouverneur Medwin, Jacksonville, Fla. (Age 44) (Claims RCA 3.4 RCM 9.5) Feb. 1942 to date with Corps of Engrs., U.S. Army, at present as Capt.; previously Archt. in private practice.

Rawn, William Peter (Assoc. M.), Washington, Iowa. (Age 56) (Claims RCA 16.0 RCM 16.2) Dec. 1929 to date County Engr., Washington County, Iowa; part of time also City Engr., Washington, Iowa; Cons. Engr. and Chf. of Party and Res. Engr., Iowa Highway Comm., etc.

Schubert, William Emil, Appleton, Wis. (Age 47) (Claims RCM 19.7) 1932 to date with Wisconsin-Michigan Power Co., Appleton, since 1940 as Vice-Pres., Gen. Mgr. and Director.

Seaman, Ayres Cromwell (Assoc. M.), Pittsburgh, Pa. (Age 39) (Claims RCA 4.6 RCM 8.9) Nov. 1941 to date Constr. Engr., Carnegie-Illinois Steel Co., Duquesne; previously Engr., Mason & Hanger Co., New York City.

Sidney, William Edwin, Pittsburgh, Pa. (Age 64) (Claims RCA 22.7 RCM 13.3) April 1925 to date with U.S. Engr. Office, Pittsburgh, Pa., in various capacities, since Oct. 1942 as Prin. Engr.; Oct. 1940 to Jan. 1941 detailed to Diablo Heights, Canal Zone, in consulting capacity.

Stokes, R. C., Dallas, Tex. (Age 51) (Claims, RCA 4.2 RCM 20.8) Sept. 1944 to date associated with Frank W. Chappell, Cons. Engr., Dallas; previously member of firm, Finn, Stokes, Taylor & Bible, Houston; Engr. with Alfred C. Finn, Archt., Houston, Tex.

Superak, Michael Peter, Riverside, Ill. (Age 40) (Claims RCA 5.2 RCM 5.4) April 1944 to date Structural Engr., Western Elec. Co., Inc., Chicago, Ill.; previously Structural Engr., The Austin Co., Cleveland, Ohio; Structural Designer, The Panama Canal, Balboa Heights, C.Z.; with Illinois Highway Dept.

Tillotson, Elbert Saunders, Mexico City, Mexico (Age 49) (Claims RCM 26.8) Oct. 1944 to date Director Gen. of Eng. and Constr., Cementos Portland del Bajio, also Chf. Engr., Ingenieros S.A., de C.V., Mexico D.F., Mexico; previously Gen. Mgr., Leonard Constr. Co., New York City; Partner and Gen. Mgr., Tillotson Constr. Co., Lansdowne, Pa.

Triest, Willard Gustav, New York City. (Age 39) (Claims RCA 3.0 RCM 9.3) Aug. 1928 to date Vice-Pres., Triest Contracting Corporation, New York City, acting as Asst. Supt. and (1936 to 1938) Pres. and Gen. Mgr. of Triest Constr. Co. (related company); since Nov. 1941 (on leave of absence) with Bureau of Yards & Docks, Navy Dept., Washington, D.C., at present on overseas duty.

Velz, Clarence Joseph (Assoc. M.) Hastings-on-Hudson, N.Y. (Age 43) (Claims RCM 18.9) Aug. 1938 to date Prof. of San. Eng. and Head of Civ. Eng. Dept., Manhattan Coll., New York City; previously with FPWA.

Vicker, Harold Arthur, Scranton, Pa. (Age 48) (Claims RCA 8.0 RCM 9.0) May 1942 to date Chf. Engr., Scranton-Spring Brook Water Service Co.; previously with Scranton Gas & Water Co.

White, George Richard, Buffalo, N.Y. (Age 50) (Claims RCA 3.9 RCM 24.4) July 1937 to date with City of Buffalo as Asst. Structural Engr. and (since July 1944) Structural Engr.

White, Joseph Anthony, Corpus Christi, Tex. (Age 41) (Claims RCA 7.6 RCM 5.7) June 1944 to date Asst. to Public Works Officer, Naval Air Station, Corpus Christi, Tex.; March 1941 to date with USNR, as Lieut. (jg), CEC-V(S) and at present Lt. Comdr. (CEC), serving as Asst. to Officer in Chg. of Constr., Caribbean Area and (at present) at Naval Air Station, Corpus Christi, Tex., being Constr. Supt.; previously with Puerto Rico Iron Works, Ponce, P.R.

Williamson, Joe, Jr. (Assoc. M.), Daytona Beach, Fla. (Age 38) (Claims RCA 2.8 RCM 9.8) May 1929 to date acting with Russel & Axon, Cons. Engrs., Inc., since Dec. 1939 as Vice Pres. and Mgr. of Florida office.

Wright, Harry Otis, Jr., Arlington, Va. (Age 38) (Claims RCA 8.0 RCM 5.7) April 1944 to date Shore Establishments Officer, West Coast U.S. Marine Corps, Div. of Aviation; previously Dist. Field Engr., Brazilian Dist., Pan American World Airways, Inc., and U.S. Eng. Dept., Res. Engr., Greenland Bases Command, McWilliams Dredging Co., Nick F. Helmers, Inc., and U.S.E.D.; with U.S. Govt. Superv. Archt., of Treasury (PBA).

APPLYING FOR ASSOCIATE MEMBER

Abramovitz, Maurice, Norris, Tenn. (Age 34) (Claims RCA 1.1 RCM 7.1) July 1943 to date with War Dept., U.S. Engr. Dept., Manhattan Dist., as Assoc. Archt. and Archt.; since Aug. 1944 at Clinton Eng. Works, as Head, Subprojects Sec.; previously with TVA; Dept. of Regional Studies; in private practice of architecture, Boston, Mass.

Albert, Paul McHenry, Ann Arbor, Mich. (Age 40) (Claims RCA 4.6 RCM 1.5) April 1942 to date Designing Engr., Shoecraft, Drury & McNamee, Ann Arbor, Mich.; previously Asst. Engr., Consoer, Townsend & Quinlan, Beatty & Childs; Engr's. Asst., City Eng. Office, Muskegon, Mich.

Billingsley, Earl Joseph (Junior), Philadelphia, Pa. (Age 34) (Claims RCA 4.6) July 1941 to date with Industrial Dept., Planning Div., Design Sec., U.S. Navy Yard, Philadelphia, Pa., as Jun. Naval Archt., Prin. Eng. Draftsman, and Chf. Eng. Draftsman; previously Jun. Hydr. Engr., U.S. Dept. of the Interior, Geological Survey, Water Resources Branch, Albany, N.Y.

Bowers, William Taisto, Cleveland, Ohio. (Age 30) (Claims RCA 4.0) Feb. 1943 to date Stress Engr., Fisher Cleveland Aircraft Div.; previously Structural Engr., Arthur G. McKee & Co.

Bowles, Ernest Marvin, Hagerstown, Md. (Age 34) (Claims RCA 3.5) Feb. 1943 to date Structural Engr., Stress Dept., Fairchild Aircraft Corporation, Hagerstown, Md.; previously with TVA, finally as Associate Office Engr.

Boynton, Abraham Webster, Arlington, Va. (Age 49) (Claims RCA 11.1) April 1941 to date Asst. Engr., Federal Power Comm.; previously with International Boundary Comm.

Burns, Bennett Winfield (Junior), Baytown, Tex. (Age 30) (Claims RCA 3.1) June 1936 to Oct. 1944 with Humble Oil and Refining Company as Jun. Engr., Design Draftsman and (since Aug. 1943) Design Engr.

Buzzi, Edward Anthony, (Junior), Torrington, Conn. (Age 35) (Claims RCA 8.3) April 1936 to date in private practice, at present as Mgr., Felix Buzzi & Son.

Clark, Royal Sanford, Columbus, Nebr. (Age 33) (Claims RCA 5.5) Sept. 1941 to date with Loup River Public Power Dist., Columbus, Nebr., since Dec. 1942 as Field Engr., Hydr. Dept.; previously County Surveyor, Platte County, Nebr.; County Highway Comm., Platte County.

Clark, Shields Eric, Jr., Vicksburg, Miss. (Age 29) (Claims RCA 2.6) Nov. 1939 to date with U.S. Waterways Experiment Station, Vicksburg, Miss., at present as Asst. Engr.

Coop, Bennett Sumner, Jr., Atlanta, Ga. (Age 40) (Claims RCA 6.9) June 1940 to date Res. Engr., representing City of Atlanta, Fulton County Sewer System, previously with City of Atlanta in various capacities, finally as Field Engr.

Curtis, Russell Greilick, Little Rock, Ark. (Age 46) (Claims RCA 5.0) June 1934 to Sept. 1935 and June 1936 to date with U.S. Engr. Office, since Sept. 1941 being Inspector (Constr.) Asst. Engr., Associate Engr., Little Rock, Ark.; in the interim with Harza Eng. Co., Chicago.

Davis, John Taylor, White Plains, N.Y. (Age 39) (Claims RCA 13.8 RCM 3.4) Oct. 1944 to date with W. A. Hoffberg, New York City; previously with The Kellex Corporation, New York City; with The Lummus Co.; with Solomon & Keis, Cons. Engrs., Troy, N.Y.; with J. B. Converse & Co., Inc., and A. C. Polk, Cons. Engrs., Mobile and Birmingham, Ala.; with New York Power & Light Corporation, Albany; with J. Russell White, Archt., Albany.

Engelhardt, Robert Lee, Santee, Calif. (Age 30) (Claims RCA 3.6) Feb. 1943 to date with Consolidated Vultee Aircraft Corporation, Industrial Eng. Dept., since June 1944 as Mfg. Engr., San Diego (Calif.) Div.; previously Field Engr., The Austin Co.; with Allis Chalmers Mfg. Co.

Fernandez-Sandoval, Miguel Angel (Junior), San Juan, Puerto Rico. (Age 33) (Claims RCA 7.6) Nov. 1939 to date with U.S. Engr. Office, War Dept., since Jan. 1942 with Office of Antilles Div. Engr. Office, San Juan, Puerto Rico.

Friedman, Sam (Junior), Los Angeles, Calif. (Age 33) (Claims RCA 3.6 RCM 2.9) May 1939 to date with U.S. Army Engrs., Los Angeles, Calif., since June 1942 as Associate Engr., Structural Grade.

Garde, Vinayak Govind, Roorkee, U.P., India. (Age 44) (Claims RCA 7.2) Oct. 1939 to date with Govt. of United Provinces as Asst. Prof. of Civ. Eng., Thomason Civil Eng. Coll Roorkee, India.

Garner, Harold Glen, Washington 4, D.C. (Age 39) (Claims RCA 9.5) May 1940 to date Field Engr., Portland Cement Assn., since Dec. 1943 in Washington, D.C.; previously Geology and Soils Engr., Missouri Highway Dept.

Gauthier, Raymond Emile (Junior), San Francisco, Calif. (Age 35) (Claims RCA 5.0) Sept. 1935 to date with Fabricated Steel Constr. Div., Bethlehem Steel Co., at present a Dist. Engr., Alameda, Calif.

Grout, Nathan, Detroit, Mich. (Age 48) (Claims RCA 7.9) April 1944 to date with Stran-Steel Div., Great Lakes Steel Corporation, Detroit, Mich.; previously with E. B. Badger & Sons Co., Boston, Mass.; with Luria Steel & Trading Corporation, New York City; Richmond (Calif.) Shipbuilding Corporation; Collidge, Shepley, Bulfinch & Abbott, Archts.

Gulden, Horace Bream, FPO, San Francisco, Calif. (Age 37) (Claims RCA 9.2 RCM 3.5) Jan. 1943 to date Lieut., CEC, USNR on active duty with construction battalions; previously City Engr. and Water-Works Mgr. for State College, Pa.

Haile, Elmer Rathbun, Jr. (Junior), Camp Berkeley, Tex. (Age 35) (Claims RCA 2.5) Nov. 1940 to date with Corps of Engrs., U.S. Army, since Aug. 1942 as Capt.; previously Jun. Highway Engr., U.S. PRA, Washington, D.C.

Hall, Austin James, Jr., Falls Church, Va. (Age 31) (Claims RCA 4.0) April 1941 to date with U.S. Army as 2d Lt., 1st Lt., Capt. and (at present) Major; since Sept. 1943 being Chf., Field Operations Sec., Constr. Branch, Middle Atlantic Div. Engr. Office.

Hamma, Clarence Dayton, Oakland, Calif. (Age 36) (Claims RCA 3.4) 1932 to date with Div. of Highways, San Francisco, Calif., since May 1941 as Asst. Highway Engr.

Herberger, Arthur Henry (Junior) Baldwin, N.Y. (Age 34) (Claims RCA 3.0) Feb. 1939 to date with Nassau County Health Dept., since Oct. 1941 as Asst. San. Engr.; also Instructor, New York Univ. Evening School.

Hetzler, Morris Clifford, Morristown, Tenn. (Age 38) (Claims RCA 2.8 RCM 1.0) Sept. 1937 to date with TVA, since Dec. 1941 as Asst. Highway Engr. (P-2).

Hollingworth, Walter Birkle, Van Nuys, Calif. (Age 43) (Claims RCA 11.7 RCM 6.7) Feb. 1938 to date with city of Vernon, Calif., as Asst. City Engr. and (since Feb. 1941) also Asst. Water Supt.; previously Civ. Engr., with Francis Bates, Cons. Engr., Vernon, Calif.

Huggins, Mark William, Toronto, Ont., Canada (Age 33) (Claims RCA 6.0) Sept. 1941 to date Asst. Prof. of Civ. Eng., Univ. of Toronto; previously Lecturer in Civ. Eng., Queen's Univ., Kingston, Ont.

Iakisch, Marshall Rudolph, Bryson City, N.C. (Age 30) (Claims RCA 5.0) June 1936 to date with TVA, since Jan. 1940 as Asst. Hydr. Engr., at present in charge of Area Office, Bryson City, N.C.

Johnson, Eugene Martin, Chicago, Ill. (Age 31) (Claims RCA 5.7 RCM 0.9) April 1942 to date with U.S. Engr. Dept., since March 1944 as Asst. to Chf. of Claims Sec., Office of Dist. Engr., U.S. Engrs.; previously with Mississippi State Highway Dept.

Judd, Arnold Morris (Junior), Louisville, Ky. (Age 29) (Claims RCA 1.5 RCM 2.1) Sept. 1939 to date with U.S. Engr. Office, Louisville, Ky., as Jun. Engr., Asst. Engr., and since Sept. 1942 Associate Engr.

Lacy, Edward Randolph (Junior), Fredericks Hall, Va. (Age 27) (Claims RCA 2.8) Nov. 1941 to date Capt., U.S. Public Health Service, U.S. Army; previously with TVA Health & Safety Dept.

Laferty, Paul Edward, Baltimore, Md. (Age 44) (Claims RCA 7.3) Aug. 1919 to date with Dept. of Public Works, City of Baltimore, since July 1943 as Associate Civ. Engr., Chf. Engr.'s Office.

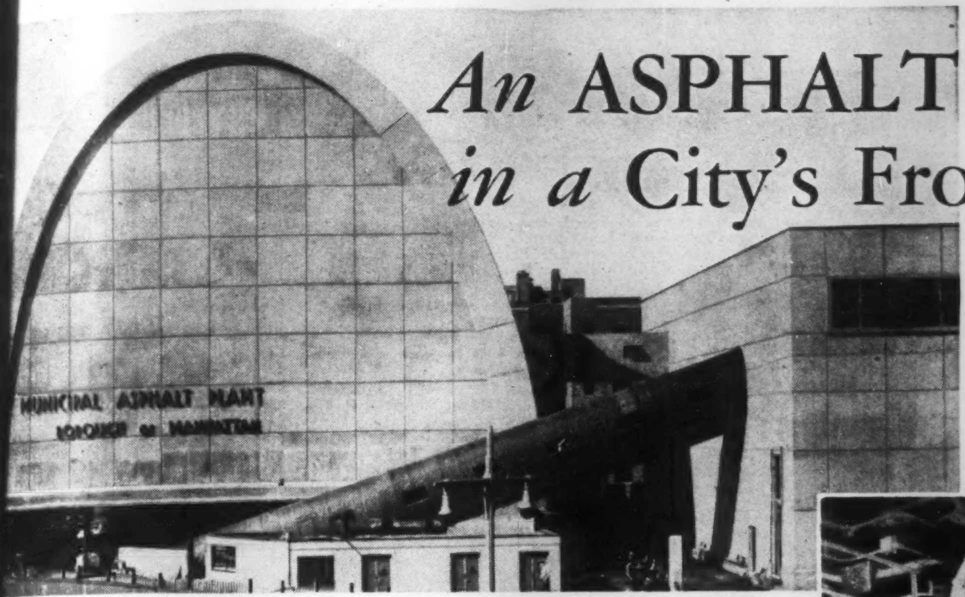
Lee, Joseph Thomas, Dallas, Tex. (Age 33) (Claims RCA 2.5 RCM 2.9) May 1936 to date with Texas Bitulithic Co., since Jan. 1942 as Gen. Constr. Supt.

Morris, Grover Lee (Junior), Oklahoma City, Okla. (Age 34) (Claims RCA 2.9 RCM 3.3) Aug. 1941 to date Asst. San. Engr., Oklahoma Health Dept.; previously with Oklahoma State Highway Dept.; with Phillips Petroleum Company.

Ostrom, George Edwin, Omaha, Nebr. (Age 58) (Claims RCA 30.5) April 1922 to Oct. 1933 Engr., and March 1935 to date Field Engr., with City Engr., Omaha; in the interim Jun. Project Engr. with State Engr., Omaha.

Partin, John Leo, Los Angeles, Calif. (Age 44) (Claims RCA 15.9) Aug. 1942 to date Civ.

An ASPHALT PLANT *in a* City's Front Yard



Exterior of the plant, facing East River Drive

by: AUBREY SMITH
Industrial Engineering Division
General Electric Company

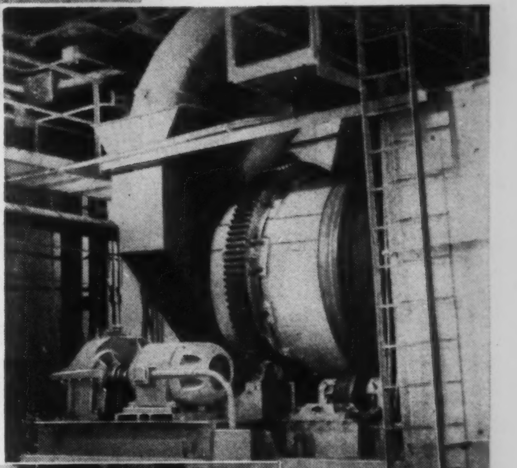
WHAT is probably the most modern asphalt plant now in use is located in New York City, in the residential and park district along East River Drive. Because of its convenient location, the old plant site was retained when a modern plant became necessary. The new buildings were designed for architectural suitability; the processes were thoroughly electrified—to eliminate soot, dust, and other objectionable features. The result is an attractive, clean, hygienic project powered, controlled, and process-heated electrically. It has capacity for a daily output of about 800 tons of high-grade street surfacing material. Provision has been made in foundations, etc. for additional units to increase the capacity to about 1100 tons.

General Electric's contribution was typical of the engineering service of our Company. District sales engineers, in co-operation with the General Office application engineers, worked with municipal officials through the contractor, to plan the best utilization of electric equipment. All the machinery—designed and installed by F. D. Cummer & Son Co., Cleveland—was G-E equipped.

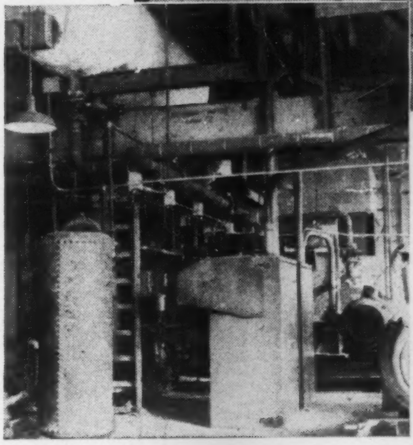
Totally enclosed G-E fan-cooled motors drive machinery in the following processes:

1. Sand and stone, received by barge, are transferred in an electrically driven tunnel conveyor through an inclined tube to storage bins; then, again in conveyors to the mixing plant.
2. The liquid asphaltic cement, fuel oil, and limestone dust are all electrically pumped from barge to storage.
3. Bucket elevators move materials from mixers to reclaiming dryers, and then into the vibrating screens.
4. Under automatic, electric control, dry materials are mixed with the hot liquid asphalt for predetermined periods, and the finished product is then dumped into waiting trucks.

Throughout this process, wherever liquid asphalt is stored or must be pumped through long pipes to the mixers, G-E Calrod heaters are used to keep it heated and flowing by holding the temperature at 300 F. Use of electric heaters exclusively has made extra piping unnecessary, avoided the need for steam heat and its attendant equipment, and reduced maintenance expense. A total of 620 kw is used for process heating.



G-E 40-hp motor operating a 60-ton, two-fire dryer



View of mixer floor during construction. Piping and surge tank are heated by G-E Calrod heaters, and controlled with CR2992 thermostats.

G-E engineers are quickly available to meet with construction men and make plans that will include the most modern electric equipment in keeping with the far-sighted projects of municipal officials. General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

BUY WAR BONDS

655-42-153

Engr., 11th Naval Dist., San Diego; previously with Office of FPWR, Los Angeles; with Office of Los Angeles County Engr.

Peltier, Eugene Joseph (Junior), Boston, Mass. (Age 34) (Claims RCA 3.9 RCM 7.0) July 1942 to date Asst. Superintending Civ. Engr., Bureau of Yards and Docks, U.S. Navy, New England states; previously with CEC, USNR; with Kansas Highway Comm.

Pepe, Salvatore Ernest (Junior), Syracuse, N.Y. (Age 34) (Claims RCA 6.2) Nov. 1933 to date with U.S. Engr. Office, since Sept. 1940 as Associate Engr. since Nov. 1943 being Engr. in Charge, Design Unit, Eng. Div.

Quinones Gonzalez, Raul Augusto, Lima, Peru. (Age 34) (Claims RCA 5.5 RCM 3.8) July 1942 to date Asst. Engr. Director, Corporation Peruana Del Santa; previously with Ministry of Public Works, Dept. of Water Eng.

Rhodes, William Ward Bernard, Knoxville, Tenn. (Age 51) (Claims RCA 18.9) May 1943 to date Estimator, Stone & Webster Eng. Co., Clinton, Tenn.; previously Estimator and Inspector, E. B. Badger & Son Co., Boston, Mass.; Project Engr., Lucas County Eng. Dept., Toledo, Ohio.

Riley, Walter Earl (Junior), Pittsburgh, Pa. (Age 27) (Claims RCA 3.8) June 1939 to date with Pittsburgh Des Moines Steel Co., since Feb. 1941 as Welding Engr.

Robert, Leonard Albert, Lansing, Mich. (Age 36) Sept. 1942 to date Instructor and Asst. Professor in Civ. Eng., Michigan State Coll.; previously Draftsman, Designer and Field Engr., Detroit (Mich.) Edison Co.; Cons. Engr., Abrams Aerial Survey Corporation and Bruce Buchanan, Cons. Engr.

Roberts, Paul Virgil, Kansas City, Mo. (Age 33) (Claims RCA 6.0) Oct. 1941 to date Airport Engr., CAA; previously Field Engr., FWA.

Schlesinger, Max (Junior), Chicago, Ill. (Age 34) (Claims RCA 6.1) March 1944 to date Tool Designer, La Salle Designing Co., Chicago; previously with Corn Products Refining Co., Chicago; with Fisher Aircraft Div., Gen. Motors Corporation, Cleveland, Ohio; with A. G. McKee Co., Contrs. & Engrs., Cleveland; with Illinois Div. of Highways.

Schrader, Otto Harry, Jr., Seattle, Wash. (Age 34) (Claims RCA 3.0 RCM 1.4) Nov. 1943 to date Wood Technologist and Engr., Timber Structures, Inc., Seattle; previously with Research Dept., Curtiss-Wright Aircraft Co., Buffalo, N.Y.; with Lower Columbia Junior Coll., Longview, Wash.

Seeger, Orville Henry, Cincinnati, Ohio. (Age 44) (Claims RCA 2.5) 1942 to date Capt., Corps of Engrs., U.S. Army; previously with Southwestern Portland Cement Co., Osborn, Ohio.

Sells, James Chat, Fort Worth, Tex. (Age 31) (Claims RCM 4.5) Sept. 1941 to date Chf. Draftsman, Freese & Nichols; previously with Lambert Landscape Co., Inc., Dallas and Houston.

Setzekorn, Kenneth Henry, Indianapolis, Ind. (Age 37) (Claims RCA 5.5) Feb. 1944 to date Engr., U.S. Geological Survey; previously with Indiana State Conservation Dept.; with Miller Yeager-Bevington Williams, Archt. Engrs.; with National Resources Planning Board; with U.S. Engr. Dept., Trinidad, B.W.I.; with R. D. Wilson, Cons. Engr.; with City of Mt. Vernon, Ill.; with WPA, Jefferson County, Ill.

Silva, Elato, São Paulo, Brazil. (Age 30) (Claims RCA 6.1 RCM 0.5) Oct. 1941 to Oct. 1944 Reinforced Concrete Engr., City of São Paulo, at present Reinforced Concrete and Constr. Engr., Sociedade Constructora Brasileira, Ltd.; previously Bridge Eng. Asst. Prof., Parana School of Eng.; Structural Asst. Engr., Comp. GEOBRA, Rio de Janeiro.

Sterling, Peter (Junior), Burbank, Calif. (Age 29) (Claims RCA 1.9 RCM 0.6) Dec. 1938 to date with Ford J. Twaits Co., Los Angeles, Calif., since March 1944 as Superv. Engr.

Sugden, Harry, Savannah, Ga. (Age 38) (Claims RCA 0.7 RCM 4.7) Feb. 1929 to date with U.S. Engr. Office, Savannah, Ga.

Weathers, Ernest Leland, McAllen, Tex. (Age 37) (Claims RCA 2.6) Feb. 1943 to date with U.S. Dept. of Interior, Bureau of Reclamation, as Engr. (P-1) and since May 1944 Engr. (P-2); previously with International Boundary Comm., United States and Mexico.

Winter, Max,, Jr., Pedro Miguel, C.Z. (Age 37) (Claims RCA 10.9) April 1943 to date Chf. Engr. and Gen. Supt., Panpacific Constr. Corporation; previously with Thompson-Markham Co.

APPLYING FOR JUNIOR

Carter, Rolland William, Montgomery, Ala. (Age 28) 1940 to date with Water Resources Branch, U.S. Geological Survey; previously with Louisiana Geodetic Survey.

Clark, Arthur Merritt, APO, New York City. (Age 27) (Claims RCA 2.3) Jan. 1941 to date Officer, Corps of Engrs., U.S. Army, at present Major; previously Jun. Engr., Alphons Custodis Chimney Constr. Co., New York City.

Harada, Masato Bernard, Honolulu, Hawaii. (Age 27) July 1941 to date with Board of Water Supply, Honolulu, T.H., as Jun. Civ. Engr. and since Sept. 1944 Asst. Civ. Engr.

Korner, Gerhard, Sydney, Australia. (Age 27) Jan. 1940 to date Asst. Engr., Bridge Design Sec., Dept. of Main Roads, Sydney, Australia.

Kosan, Robert Bohdan, Cocoli, Canal Zone. (Age 27) Nov. 1940 to date Chf. of Party (acting as Contr.), The Panama Canal, Municipal Eng. Div.; previously with City of Pittsburgh, Pa.

Moyer, Paul Edwin, Camp Breckinridge, Ky. (Age 23) March 1943 to date with U.S. Army, at present as Pfc; previously Shipfitter, Willamette Iron and Steel Corporation, Portland, Ore.; Chainman, U.S. Army Engrs., Portland.

Papanek, Maxwell Charles, Philadelphia, Pa. (Age 26) (Claims RCA 1.6) Feb. 1942 to date with Cramp Shipbuilding Co., Philadelphia, Pa., since Oct. 1942 as Asst. Chf. Planner of Outside Machine Shop; previously Technician and Draftsman, Gibb & Cox, Inc., New York City.

Polak, Matthys, Berkeley, Calif. (Age 26) July 1944 to date Asst. Engr., Kaiser Co., Oakland; previously Aug. 1942 to July 1944 Eng. Aide Asst., Richmond Shipyards; student.

Schafer, Andrew George, FPO, San Francisco, Calif. (Age 27) (Claims RCA 0.8) July 1943 to date Ensign, CEC, U.S. Navy, Constr. Bn.; previously with U.S. Engr. Dept., Huntington, W.VA.

Souza, Machado, Othelo de, São Paulo, Brazil. (Age 29) (Claims RCA 4.0) March 1944 to date Asst. Prof., São Paulo State Univ., Brazil; previously (intermittently) with Institute for Technological Research, São Paulo.

Wustmann, Herbert Francis, Akron, Ohio. (Age 30) (Claims RCA 3.0) March 1941 to date Contr. Engr. and Mgr. of Dimensional Control, Goodyear Aircraft Corporation, Akron, Ohio; previously as Inspector, Illinois Central R.R., Chicago, Ill.; Inspector of Structures, U.S. Engr. Corps, Sardis, Miss.

1942 GRADUATE

UNIV. OF CALIF.

(B.S. in C.E.)

Flynn, Hugh Francis	(24)

1943 GRADUATE

WORCESTER POL. INST.

(B.S. in C.E.)

Golding, George Warren, Jr.	(23)

1944 GRADUATES

ALA. POL. INST.

(B.S. in C.E.)

Rainer, Rex Kelly	(20)

CALIF. INST. TECH.

(B.S. in C.E.)

Brodie, Robert Pearson	(21)
Chang, Leonard Ivan	(23)
Clendenen, Frank Byron	(21)
Dana, Ilif Ross, Jr.	(21)
Earl, Joseph Benjamin, II	(20)
Hinton, Warren David, Jr.	(21)
Hudson, Thomas Allan	(21)
Karstedt, Ferdinand Herman	(21)
Kuhns, Richard Eli	(21)
Long, Neville Stuart	(21)
MacDonald, Francis Edward, Jr.	(21)
Moore, Return Francis	(21)
Palmer, Raymond Jefferson	(20)
Phelps, Joseph Mansfield	(20)
Saunders, George Reamer	(20)

UNIV. OF COLO.

(B.S. in C.E.)

Anderson, Ewalt Permenio, Jr.	(21)
Binder, Richard Gordon	(21)
Burns, John Allen	(22)
Haase, Edward Norman	(22)
Hood, George Albert, Jr.	(20)
Hoopes, Edgar Malin	(21)
Hughes, Wallace Dean	(21)
Jensen, Alonzo Maxfield	(21)

COOPER UNION

(B.C.E.)

Zubkoff, Seymour	(20)

ILL. INST. TECH.

(B.S. in C.E.)

Goldblatt, Selwyn Donald	(20)
Hiramoto, John Jitsutaro	(29)
Rotter, Leonard	(20)
Schwartz, Milton Mayer	(20)
Therrio, Paul Pierce	(22)

UNIV. OF ILL.

(B.S. in C.E.)

Ascherman, John Calvin	(20)
Green, David	(21)
Monohon, Paul Joseph	(21)
Rees, Thomas Frank	(21)
Rohner, Ralph Joseph	(20)
Sorkin, Burton	(20)
Weinberg, Herbert	(21)
Wilson, Wendell H.	(21)

(B.A. in A.E.)

Buettner, Robert Paul	(24)

(also B.S. in Arch., Univ. of Cin., 1943)

UNIV. OF LOUISVILLE

(B.C.E.)

Lovell, Charles William, Jr.	(22)
Warner, Clyde King, Jr.	(21)
Zeller, Roderick Lanham, Jr.	(22)

(B.S. in C.E.)

Waggener, Paul Holladay, Jr.	(23)

COLL. OF CITY OF NEW YORK

(B.C.E.)

Dubowy, Saul	(24)
Friedman, Harold U.	(21)
Gleich, David	(22)
Kass, Herbert	(21)
Libove, Charles	(21)

UNIV. OF PA.

(B.S. in C.E.)

Bowen, Walter Charles	(21)
Glassgold, Israel Leon	(21)
Wintz, Joseph Anthony, Jr.	(20)

PRINCETON UNIV.

(B.S. in C.E.)

Hall, David Crawford	(20)

PURDUE UNIV.

(B.S. in C.E.)

Hoffman, Donald Myron	(20)
Oliver, James Russell	(22)
Sertell, James Yule	(21)
Shaw, James Anthony	(21)

RENS. POL. INST.

B.C.E.)

Kolb, Edward Paul	(23)

UNIV. OF SO. CAROLINA

(B.S. in C.E.)

McDowell, Robert Arnold	(22)

SYRACUSE UNIV.

(C.E.)

Petrasek, Franklin Albert	(21)

UNIV. OF TENN.

(B.S.)

Manley, Bryan Sewall, Jr.	(23)

TEXAS TECH. COLL.

(B.S. in C.E.)

Knowles, Doyle Blewer	(20)

TULANE UNIV.

(B.E. in C.E.)

Fromherz, Thomas Alvin	(20)
Wilson, Troy Leonard, Jr.	(20)

UNIV. OF UTAH

(B.S.)

Overfelt, Ira Eugene	(22)

VA. POL. INST.

(B.S. in C.E.)

Hastings, Richard Garland, Jr.	(20)
Holmes, Irvin Richardson	(20)
Nance, Hubert Ashby, Jr.	(20)

VIRTUAL GRADUATES

UNIV. OF CONN.

(B.S. in E.)

Fiore, Louis Peter	(20)
Voloshin, Arnold Elliot	(21)

(Requirements completed. Degrees to be conferred in 1945.)

The Board of Direction will consider the applications in this list not less than thirty days after the date of issue.

"A name worth remembering"

Fairbanks-Morse

To search constantly for ways to improve is a basic Fairbanks-Morse policy. Development work goes on continually in our research laboratories—in good years and bad, in time of peace and in time of war. During the months and years ahead this research will yield a rich harvest to users of scales, Diesels, generators, motors, or pumps.

R.H. Morse Jr.
General Sales Manager

FAIRBANKS-MORSE
SPRINGLESS
FAIRBANKS-MORSE

Sturdily built without springs or delicate parts, Fairbanks-Morse Scales are more than highly accurate weighing instruments. In their countless types, styles, and modifications they weigh while materials are *moving*, furnish *printed* weight records, *count* small parts and products, weigh and disburse preset amounts *automatically*, and can keep ingredient proportions *secret*.

Fairbanks, Morse & Co.
Chicago 5, Illinois

Scales

Diesel Locomotives • Diesel Engines • Generators • Motors Pumps • Scales • Magnetos Stokers • Railroad Motor Cars and Standpipes • Farm Equipment

BUY MORE WAR BONDS

© 1944 Fairbanks, Morse & Co.

Engineering Societies Personnel Service, Inc.

NEW YORK	CHICAGO	DETROIT	SAN FRANCISCO	BOSTON
8 W. 40TH ST.	211 W. WACKER DR.	100 FARNSWORTH AVE.	57 POST ST.	4 PARK STREET

The items listed below have been furnished by the Engineering Societies Personnel Service, Inc., which is under the joint managemen of the Four Founder Societies. This service is available to members and is operated on a cooperative, non-profit basis. In applying for positions advertised by the Service the applicant agrees, if actually placed in a position through the Service as a result of these advertisements, t pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficien non-profit personnel service and are available upon request. This also applies to registrants whose notices are placed in these columns. Al replies should be addressed to the key numbers indicated and mailed to the New York Office.

A weekly bulletin of engineering positions open is available to members of the cooperating societies at a subscription of $3 per quarte or $10 per annum, payable in advance.

MEN AVAILABLE

CIVIL ENGINEER; Jun. Am. Soc. C.E.; age 33; B.S.C.E.; 12 years' experience on design and construction. Experienced contractor's engineer, three years. Resident engineer on construction of outlying bases. Seeking opportunity with contractor or engineer in New York City or vicinity. Proved ability to shoulder responsibility and hard work. Available January 1, 1945. C-110.

CIVIL ENGINEER; M. Am. Soc. C.E.; age 38; draft status 1-CH; M.S., C.E.; registered in Pennsylvania; 15 years' broad experience, including surveying, planning, design, teaching, and the preparation of engineering reports and investigations. Desires position in administrative, management, or consulting engineering field. Available upon reasonable notice. C-111.

GRADUATE CIVIL ENGINEER; Jun. Am. Soc. C.E.; B.S.C.E. and C.E. degrees; 32; 5 years' experience in construction and handling men; also 5 years in engineering sales. Honorably discharged. Available immediately. Any location considered. C-112.

POSITIONS AVAILABLE

CIVIL ENGINEER, who is familiar with design for reinforced concrete structures, steel, and wood-truss work. Prefer a man who is familiar with the latest methods used for designing reinforced concrete structures. Man familiar with building construction requirements preferred. Permanent. Location, Washington, D.C. W-4382.

CIVIL ENGINEERS; 25–45; single preferred. Must have a knowledge of Spanish. Work consists of concession boundary surveys, property line surveys, well locations, road location and construction, and some building construction. Salary, $3,600 a year, on a two-year contract. Company will pay transportation and living expenses. Location, Venezuela. W-4391.

INSTRUCTOR to teach civil engineering subjects and applied mechanics, both theory and laboratory. Salary, $2,400–$2,880 for a ten-month period. Location, Connecticut. W-4436.

ENGINEER, thoroughly experienced, to act to some extent as designer and shop detailer for plate work and structural steel. Should be familiar with stress calculations. Will be required to act as checker. Permanent. Salary, $3,640 a year and up, according to qualifications. Location, New York Metropolitan Area. W-4491.

ENGINEERS. (*a*) Architectural Engineer and Structural Engineers, 40–50, for power plant design. Salary open. (*b*) Structural Draftsmen and Architectural Draftsmen for power plant design. Salary, $4,200 a year. Location, New York, N.Y. W-4518.

ARCHITECTURAL ENGINEERS, civil or architectural graduates, with at least 3 to 5 years experience in building construction, including both design and field construction work. Must be thoroughly familiar with all phases of industrial design and construction, including structural heating, ventilating, plumbing, and electrical Location, New York State. W-4544.

CIVIL ENGINEERS, experienced in public works with editorial and research experience, for the positions of Staff Assistant, at $3,000 a year, and Assistant Director, at $4,000 a year, of a trade association. Location, Illinois. W-4576C.

CIVIL ENGINEER to head up a hydrologic service of the Division of Irrigation. Responsible for collection of stream-flow data from the principal streams of the country, particularly those that may be used for irrigation, to make studies of the silt load of many streams. Establish rating and gaging stations out in the field. Knowledge of Spanish desirable. Salary good. Headquarters, Caracas, Venezuela. W-4590.

CIVIL ENGINEER, 35–45, graduate preferred. Must be experienced in municipal engineering, particularly design and supervision of construction, street paving, or sewers. Must be licensed. Write, stating experience, salary expected and references, and enclose photograph. Location, Ohio. W-4615D.

INSTRUCTOR to teach civil engineering for Navy program. Salary, to $3,900 a year. Location, Texas. W-4617.

SANITARY
OR CIVIL
ENGINEER
WANTED . . .

with background of experience including basic knowledge of sewage treatment processes and plant design for a permanent position with prominent sewage treatment plant equipment manufacturer.

Positions open include application engineering in office and development for sales engineering in field. Either type of positions offer excellent opportunity for advancement and provides practical experience in all phases of sewage treatment.

State full details concerning qualifications, type of position desired, starting salary range desired, and personal data in letter of application.

Address: Advertising Department
Civil Engineering
33 West 39th St. New York 18, N. Y.

RECENT BOOKS

New books donated by the publishers and filed in the Engineering Societies Library, or in the Society's Reading Room. Notes regarding books are taken from the books themselves, edited by the staff of the Society or of the Library. Books in the Library may be borrowed by mail by Society members for a small handling charge.

AIDS TO TECHNICAL WRITING. By Richard C. Jordan and Marion J. Edwards. University of Minnesota, Engineering Experiment Station, Minneapolis, 1944. 117 pp., illus., 9 × 6 in., paper. This bulletin (No. 21) aims to segregate and summarize methods which lead to interesting and effective technical writing. All aids for one field—that of mechanical engineering—have been completely presented, though most of the material is applicable to all engineering fields. The proper design of the format, the preparation of illustrations and drawings, the use of accepted symbols and abbreviations, and the correct handling of bibliographies, numbers, and equations are among the topics covered.

CLIMATE AND THE ENERGY OF NATIONS. By S. F. Markham. Oxford University Press, London, New York, and Toronto, 1944. 236 pp., tables, maps, $8^{1}/_{2} \times 5^{1}/_{2}$ in., cloth, $3.50. This volume is revised and enlarged from an earlier edition, first published in England in 1942. In particular, three new chapters dealing with climate and energy in the United States have been added. The study is based on close statistical investigation and extensive travels in all parts of the world, and the argument culminates in the idea of climatic control, or the conditioning of climate, by the mind and invention of man.

THE CONTROL OF GERMANY AND JAPAN. By H. G. Moulton and L. Marlio. Brookings Institution, Washington (D.C.), 1944. 116 pp., tables, maps, $9^{1}/_{4} \times 6$ in., cloth, $2. This new publication of the Brookings Institution is concerned with the problem of preventing future military aggression by Germany and Japan. The possibilities of their control by various economic measures, such as restriction of the importation of raw materials and the control of key industries, are discussed and the disadvantages of various plans are noted. A military control plan, which offers possibilities and which the authors believe to be the only effective means of checking aggression is, described.

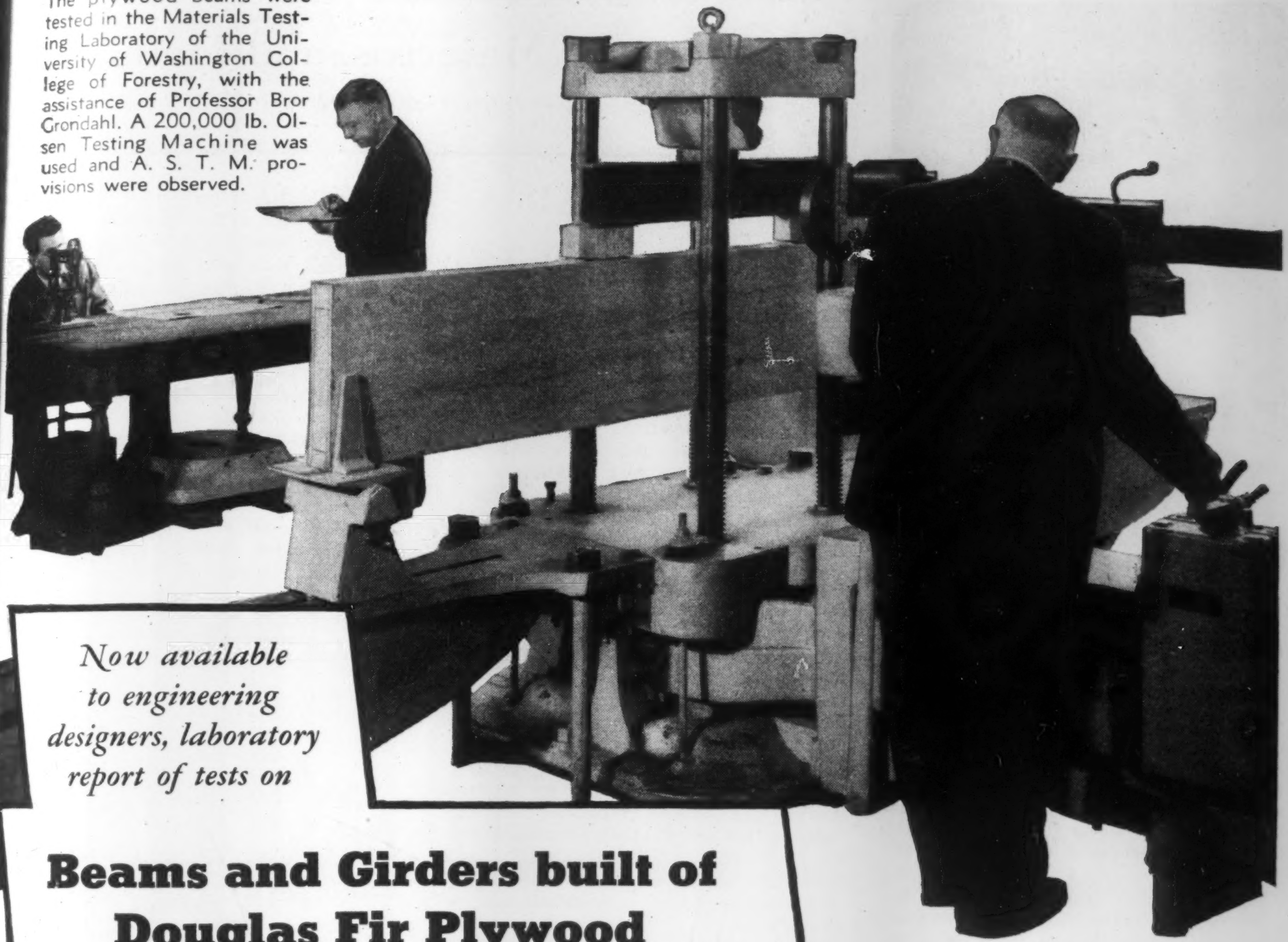
EXPERIMENTAL STRESS ANALYSIS, Vol. 1, No. 2. Proceedings of the Society for Experimental Stress Analysis. Published by the Addison-Wesley Press, Inc., Cambridge (Kendall Square Bldg.), Mass., 1944. 132 pp., illus., diagrs., charts, 11 × 8 in., cloth, $4. This volume consists of the papers contributed through the Society for Experimental Stress Analysis to the joint meeting with the Applied Mechanics Division of the American Society of Mechanical Engineers, held in New York, December 2-4, 1943.

THE GEOGRAPHY OF WORLD AIR TRANSPORT. By J. Parker Van Zandt. Published by the Brookings Institution, Washington (722 Jackson Place), D.C., 1944. 67 pp., illus., 9 × 6 in., cloth, $1. The Brookings Institution has initiated a program of economic research in aviation, and is planning to publish a series of small volumes under the general title, "America Faces the Air Age." This introductory volume reappraises our conventional ideas of geography and transportation economics and seeks to uncover some of the facts on which international air policy should be based.

Government of India Central Irrigation and Hydrodynamic Research Station. **ANNUAL REPORT (TECHNICAL) OF WORK DONE DURING THE YEAR 1941–1942 AND INDEX FOR 1937-1942.** By C. C. Inglis and Others. Published by the Manager of Publications, Delhi, 1943. 34 pp., illus., tables, diagrs., charts, maps, 13 × 8 in., paper board, 11*s*. 6*d*. Part I of this book consists of an introduction giving a synopsis of the work. Part II deals with specific experiments, and Part III is entitled "Basic Experiments in Connection with Research into Specific Problems."

MEN OF SCIENCE IN AMERICA, the Role of Science in the Growth of Our Country. By B. Jaffe. Simon & Schuster, New York, 1944. 600 pp., illus., diagrs., charts, tables, 9 × 6 in., cloth, $3.75. A broad picture of the growth of science in the United States is presented by means of a series of biographical sketches. The lives and achievements of nineteen of the foremost American scientists are viewed against their historical background, with emphasis on the influence of scientific discovery upon the social structure. The future of science in America is briefly suggested in the last chapter, and a full list of sources and reference material is included.

The plywood beams were tested in the Materials Testing Laboratory of the University of Washington College of Forestry, with the assistance of Professor Bror Grondahl. A 200,000 lb. Olsen Testing Machine was used and A. S. T. M. provisions were observed.



Now available to engineering designers, laboratory report of tests on

Beams and Girders built of Douglas Fir Plywood

The recent use of I-beams, girders and box-beams with plywood webs for numerous industrial buildings has aroused considerable interest among the nation's engineering designers. Previous reports,* published by the Douglas Fir Plywood Association laboratory, have covered the results of exploratory tests on relatively small beams.

The latest laboratory report details the fabrication and testing of 13 full-scale plywood beams 25 feet in length and from 18 to 36 inches in depth. An outline of fabrication methods, a discussion of fabricating techniques and an analysis of material and labor costs are covered in Part One of the report.

Part Two discusses the test methods, strain gauge results, test results, observation and conclusions. In general, the conclusion justified by the results of these and previous tests is that built-up plywood beams can be accurately designed by using recognized engineering formulas and methods, and that such members will perform according to the elastic theory.

The full report is of interest to engineering designers concerned with the utilization of plywood as a structural material. A copy of the report is available upon request to N. S. Perkins, Technical Director, Douglas Fir Plywood Association, Tacoma 2, Washington.

*No. 27. "Fundamental Shear Stress Values and Exploratory Tests of Small Built-up Beams."

No. 28. "Stress Distribution and Ultimate Load Tests on Eight-Foot Plywood Girders."

No. 29. "Load Tests on Additional Eight-Foot Plywood Girders."

PLYPANEL D.F.P.A.
TRADE MARK REG. U. S. PAT. OFF.

GENUINE
PLYWALL
TRADE MARK REG. U. S. PAT. OFF.
Douglas Fir Plywood
WALLBOARD
D. F. P. A.
INSPECTED

GENUINE
DOUGLAS FIR
PLYFORM
TRADE MARK REG. U. S. PAT. OFF.
Concrete Form Panel
D. F. P. A.
INSPECTED

GENUINE
PLYSCORD
TRADE MARK REG. U. S. PAT. OFF.
SHEATHING
D. F. P. A.
INSPECTED

EXT.-D.F.P.A.
TRADE MARK REG. U. S. PAT. OFF.

DOUGLAS FIR
PLYWOOD
LARGE. LIGHT. STRONG.
Real Wood
PANELS

SPECIFY DOUGLAS FIR PLYWOOD BY THESE "GRADE TRADE-MARKS"

New Worlds
TO CONQUER IN 1945

Look out for suddenly issued orders that may quickly end much war goods manufacturing. Look for swift changes to many urgently demand peace-time products. Whenever, or whatever these changes may be, water in abundance will still be an absolute necessity.

Now is the time to check your needs for a thoroughly modern, quality built and ever dependable Layne Well Water System. You will want the best that money can buy; a water system that will last the longest, take less in up keep cost and operate at a new low in economy.

Layne Pumps and Well Water Systems have a reputation that extends around the world. They are more widely used than any other make on the face of the globe. They are serving more cities and industries than all other makes combined. As a pioneer in both well installation and pump building, Layne has created, proven and uses exclusively the greatest number of major efficiency features.

Be prepared for the changes of 1945! Get the facts about Layne Pumps and Well Water Systems now. For new literature, or the counsel of an experienced Layne engineer, address Layne & Bowler, Inc., General Offices, Memphis, Tennessee.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada

LAYNE

WELL WATER SYSTEMS
DEEP WELL PUMPS

FOR CITIES, INDUSTRIAL PLANTS, RAILROADS, MINES, AIR CONDITIONING, IRRIGATION PROJECTS

Equipment, Materials, and Methods

New Developments of Interest, as Reported by Manufacturers

New Du Pont Air Duct

TO MEET WAR-TIME NEEDS, a new type of portable air duct—flexible but non-collapsible—has been developed by Du Pont engineers for either blower or exhaust systems.

It is an improved "Ventube" flexible ventilating duct designed primarily for auxiliary ventilation in ship construction, loading and unloading, cleaning or repairing ships. It also is suitable for other industrial uses such as building and maintenance of vats, tanks, tank cars, boilers, or for rapidly changing air in workrooms or drying rooms. Non-collapsible "Ventube" is a sleeve or tube of standard "Ventube" impregnated cloth, either regular or fire resistant, with a tempered steel helical spring inside it. Thus the maximum air-flow opening is maintained, regardless of whether the duct is bent sharply or the system is blowing or sucking air. When bent to an angle of 180 degrees it will exhaust eight times more air than the old style tubing. "Ventube" is made by impregnating and coating especially selected fabrics with a high-grade abrasion-resistant compound that is water resistant and impermeable to air. The fabric also is highly resistant to heat, moisture, mildew and dry rot.

Hydraulic Dredge

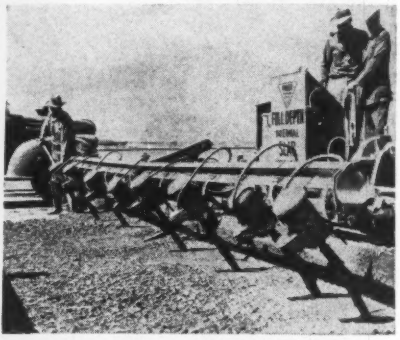
A NEW 12-IN. hydraulic dredge is now being produced by the American Steel Dredge Company, Inc., Fort Wayne, Ind., for the U.S. Army Engineer Corps. The new dredges are reported to be completely integrated, of very compact design, and are fully equipped to operate in isolated locations for long periods. They require no supply service except for fuel oil, lube oil, and sustenance for personnel. They are designed to handle sand, clay, and silt to a depth of 16 ft and deliver the material through a maximum of 1,000 ft of discharge line at water level, or 500 ft of discharge line at 30 ft elevation.

The general specifications call for a main dredging pump with a 14 in. suction and 12-in. discharge pipe, powered by an eight-cylinder, 320-hp diesel engine; a main power plant of an 85-kw diesel electric generator set, and an auxiliary diesel power plant of 6 kw. The 104 × 29 × 6-ft bolted steel hull enables shipment of the complete dredge, on standard railroad cars and as hold cargo to overseas destinations. No fabrication is necessary at the site of erection. Its pre-fabricated steel plates and sections join easily, and the hulls are completely watertight.

The dredge has a 36-ft digging ladder provided with an adequate margin of overload capacity, and fitted with interchangeable cutter heads to meet the changing character of material encountered on different projects. The unit is equipped with a five-drum hoist which enables extremely high rope pull at low speeds due to special compound gearing. Cone friction clutches are used and a drum switch controlling the hoist makes its operation extremely flexible.

Multiple Vibrating Machine

SUPPLEMENTING ITS LINE of electric, pneumatic, and gasoline vibrating machines for concrete construction, Viber Company, 726 South Flower St., Burbank, Calif., has, after six years of experimental research, perfected a new multiple, high-speed, internal full-depth slab vibrating machine, especially designed for heavy-duty airport runways, warm-up aprons, turnarounds, and postwar super thick highways for heavy-duty hauling.



Interesting facts developed at Lindbergh Field, where the machine is in use, show the concrete mix is $5^1/_2$ sacks per cu yd, with a 3-in. maximum sized rock and 2-in. maximum slump. Placing approximately 2000 yd per day on a 10-hour shift, the Viber Vibrating Machine handled this 200 yd per hr, operating between 10 and 15% of the time, and using eight of the 3-in. diameter vibrators on the 25-ft slab, which is 12 in. in thickness. Finished construction revealed that the Viber Slab Machine will vibrate the stiffest concrete on slabs of twelve inches and more thickness, as fast as it can be economically placed on the subgrade. Only one man is required to operate the machine, which can vibrate concrete at a travel rate of from 0 to 22 ft per minute. This flexibility and speed on the headers is due to the fact that the machine is propelled with a fluid motor, which gives an infinite range of speed, it is reported. The 25-ft wide bar lift, to which the battery of vibrators is attached, is hydraulically controlled, permitting the operator to effect easy positioning control of the vibrators as the machine approaches expansion joints and other obstacles. This vibrating machine is designed to use 8 to 18 internal high-speed (9500 rpm) vibrators depending on the job requirements and gives full depth vibration to the slab.

New Electric Megaphone

A new portable electric megaphone which is said to beam the voice directly to the desired area and project normal speech to long distances has been announced by National Scientific Products Co., 5013–25 North Kedzie Ave., Chicago 25, Ill. Actual tests under favorable conditions have recorded distinct voice projection up to one-half mile, according to the manufacturer.

It is claimed that the instrument has proved of value to fire and police departments at scenes of disaster. Railroads are said to be using it to warn section crews of approaching trains, and to direct traffic in switch yards. Civil engineers, contractors, and loggers are finding it of help where workers are dispersed over a large area. The Merchant Marine uses it for intership communication at sea, and in loading operations at docks.

The completely waterproof and watertight megaphone cabinet is $9\frac{1}{2} \times 4\frac{1}{2} \times 7\frac{1}{8}$ in., and weighs $11\frac{1}{4}$ lb. Amplifier chassis is shock mounted to the top section of the cabinet, permitting easy access to the component parts for ready servicing or replacement. Speaker is $13\frac{1}{4}$ in. long with $7\frac{3}{4}$ in. diameter bell opening. Speakers and microphones contain new molded phenolic diaphragms which are also completely waterproofed. Batteries provide 40 hours of efficient operation and still retain 70% of original voltages. Power is used only during actual voice transmission.

Hydraulic Turbine Award

The Newport News Shipbuilding and Dry Dock Company has received an award of nine 100,000 horsepower hydraulic turbines for installation on the Dnieper River at Dnieprostroi in Soviet Russia. They will replace installations built by the same Company in the years 1929 to 1932 and which were destroyed during the war in 1941. The new equipment will have at least 15 percent greater output than the original installation.

Construction of the units in this country for Dnieprostroi was approved by the War Production Board.

PILOT PLANT
Sets the Pace in the
Drive for BETTER
TREATED LUMBER

WOOD PRESERVATION, to be effective, calls for plenty of push to drive the preservative deep into the wood. Painting it on or dipping gives an illusion of adequacy, but it's a case of "only skin deep"—unable to handle the hard jobs expected of treated lumber.

PRESSURE TREATMENT is the basis on which all the wood-preserving industry's service records are built. Pressure treatment with Wolman Salts* preservative produces Wolmanized Lumber*—wood with ability to stand up on the toughest jobs. Its dependability has been proved by millions of feet, some in service nearly twenty years.

OUR PILOT PLANTS start with the pressure process as a *must.* Constant research there, in the laboratory, and in the field, is helping to make wood treatment even more effective. American Lumber & Treating Company, 1654 McCormick Building, Chicago 4, Illinois.

*Registered Trade Marks

WOOD THAT'S *Alloyed* FOR SAFETY AND ENDURANCE

AMERICAN LUMBER & TREATING COMPANY

Prepare NOW
for POST-WAR

AIRPORT
ENGINEERING

AIRPORT
ENGINEERING

By H. O. SHARP, *Professor of Geodesy and Transporation Engineering;* G. REEDSHAW, *Assistant Professor of Geodesy and Transportation Engineering;* JOHN A. DUNLOP, *Assistant Professor of Geodesy and Transportation Engineering; all at Rensselaer Polytechnic Institute.*

After the war there will be an enormous boom in commercial and private aviation. Thousands of airports and flight strips will be constructed in every country in the world . . . and the airport engineer will be in universal demand.

AIRPORT ENGINEERING is not an advanced, detailed treatise. It is an overall picture of present problems and the most up-to-date, efficient methods for their solution. It analyzes the building of an airport as a series of processes . . . location planning, arranging service buildings, grading and draining, stabilizing construction, treatment of soil, etc. It is a book that should be on every forward-looking engineer's and architect's desk. Consult it RIGHT NOW in order to prepare for the coming post-war boom!

150 Pages Illustrated $5.00

CONTENTS

Size and Site of an Airport—Planning the Site Selected—Surveys Preliminary to Design—Grading—Drainage of Airports—Soil Stabilization—Flexible-Type Pavements—Rigid-Type Pavements—Airport Lighting—Airport Buildings—Construction and Maintenance Equipment.

Don't delay. This book is important to you *NOW!* Fill out and mail this coupon today. Don't pay for the book unless you decide to keep it.

JOHN WILEY & SONS, Inc.
440 Fourth Avenue New York 16, N. Y.

ON APPROVAL COUPON

JOHN WILEY & SONS, Inc.
440 Fourth Avenue, New York 16, N. Y.

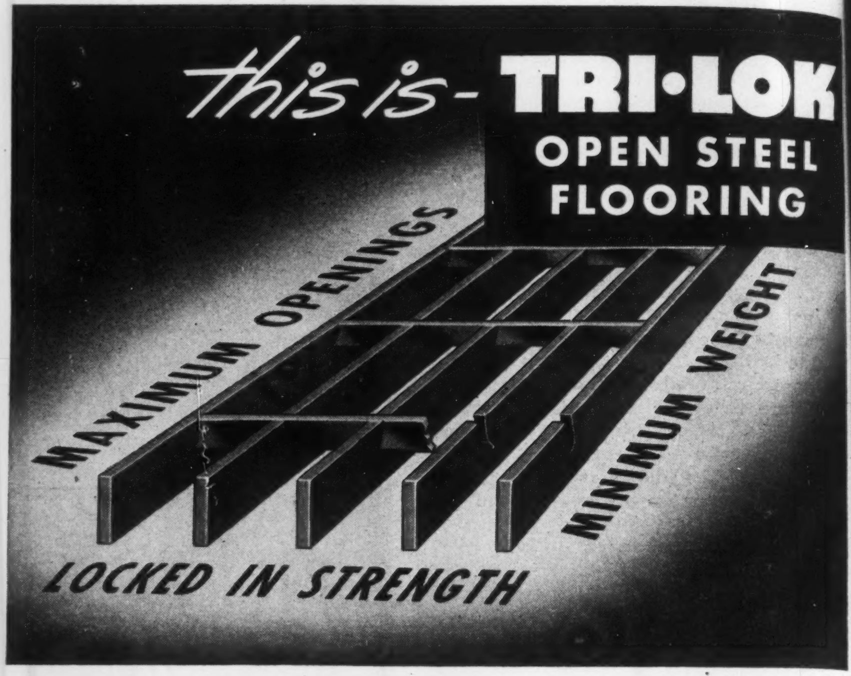
Please send me a copy of Sharp, Shaw, & Dunlop's AIRPORT ENGINEERING on ten days' approval. At the end of that time, if I decide to keep the book, I will remit $5.00 plus postage; otherwise I will return the book postpaid.

Name...

Address...

City and State...

Employed by.................................CE-12-44



For strength and simplicity, only two parts are used — bearing bars which carry the load and have curved slots punched ABOVE THE NEUTRAL AXIS, and cross bars, of the same cross sectional area as the slot itself, pressed into these slots to distribute the load. No rivets, bolts or welds are required, thus eliminating the possibility of loose joints. Tri-Lok flooring comes in rectangular, diagonal and U shapes with Safety Steps — ask for Bulletin 1140 — DRAVO CORPORATION, NATIONAL DEPARTMENT, 300 Penn Avenue, Pittsburgh (22), Pa. (Distributor for THE TRI-LOC COMPANY)

DRAVO

Modern Engineering Alloys

ANTICIPATING ENGINEERING requirements for materials which will withstand corrosion and wear and perform with a minimum of maintenance under difficult conditions, Bridgeport Brass Company has perfected a group of alloys trademarked Duronze high copper engineering alloys, containing small quantities of silicon, aluminum, and tin.

Duronze is replacing other materials in many applications where resistance to severe corrosion, strength and toughness, wearability, and ease of manufacture are required, the company reports. For example, cold-headed bolts made from Duronze average more than 100,000 lb per sq in. tensile strength, are nonrustable, and will withstand weathering in outdoor service. Duronze alloys have many applications in water supply and sewage disposal systems—screens and filters; gates, rods, weirs and baskets; bolts and nuts; and other equipment that must be strong, wear and corrosion resistant. Duronze has been used with success for valve stems, gates, seats, and bushings. This alloy has an exceptionally low coefficient of friction when in moving contact with steel. Duronze worms, pinions, and other gears meshing with steel last longer. Duronze tubing outlasts other tubing alloys in brackish salt water polluted by sewage and factory wastes, and is excellent for conveying brine solutions. Duronze alloys are ideal for marine use where ma-

KEEP
THEM
BURNING
TO SPEED PRODUCTION
Return Empties Promptly—
Cylinders Are Your
Gas Supply Line

erials must withstand the corrosive effects f salt water spray and dampness.

Bridgeport's revised Duronze manual, ontaining technical data and suggested pplications has just been published. A opy may be obtained by a request on ompany stationery.

New Bruning Printer

New reproduction advantages—as well as double utility—are offered by a new machine recently announced by the Charles Bruning Company of Chicago. This machine, the BW-Copyflex Model 2 Continuous Printer, makes it possible to duplicate anything drawn, typed, printed, or illustrated, as well as to make BW prints.

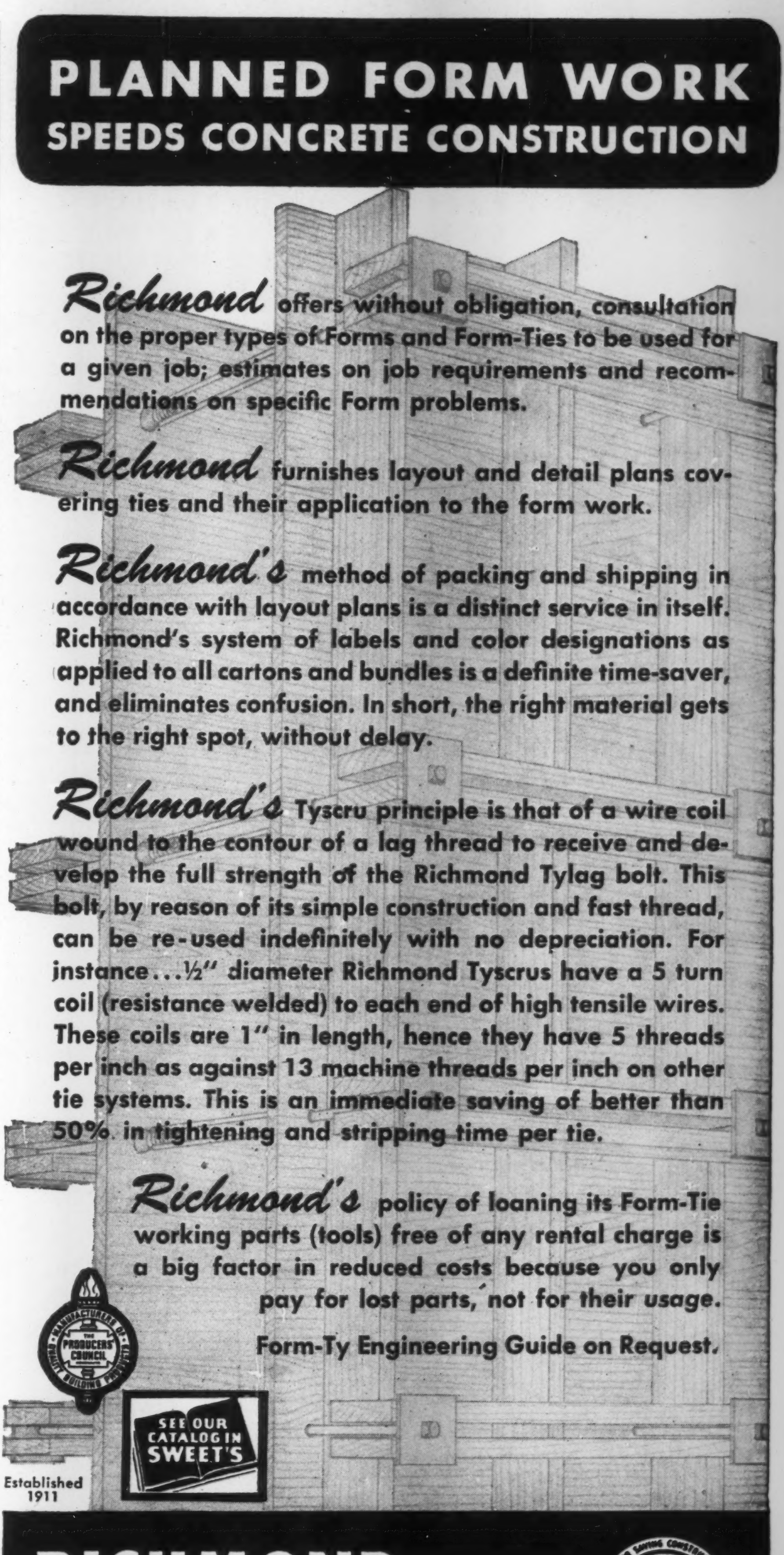
This BW-Copyflex Continuous Printer exposes, with the use of Copyflex materials, tracings, line drawings, specifications, Van Dyke negatives blueprints, etc. Original material with copy on both sides can be reproduced on either side or both sides. It exposes roll stock or cut sheets up to 24 in. wide at a speed of 5 to 30 in. per minute. Copyflex Prints are developed in trays and dried in a simple drier (readily available). With the flick of a switch, the Model 2 becomes a BW Printer for exposing Black and White Prints. Another new Bruning machine—the Model 153-M BW Developer—is used for developing BW Prints. Prints are delivered ready for use. This machine develops cut sheets or roll stock up to 24 in. at 12 ft per minute.

Water Analysis Apparatus

The Aero-Titrater, a product of Chief Chemical Corporation, 1123 Broadway, New York 10, N.Y., furnishes the plant operator and laboratory technician with a rapid, precise method for the determination of hardness, calcium and magnesium in waters, both industrial and potable.

So simple is the apparatus that any operator can readily master its operation. It makes use of a new endpoint, based on the foam-meter principle. This endpoint is unmistakable and is reproducible with a high degree of precision. Determinations are made within ten minutes and there is no waiting time to observe stability of lather. The operation is foolproof and gives identical results with different operators.

The instrument is supplied calibrated and ready for assembly and use. There are no moving parts to wear out and no delicate features to go out of adjustment. All vital parts are of durable plastic construction. It can be used directly with samples which contain chlorides up to 2000 ppm. Sulfates up to 1000 ppm are also without effect. Large iron concentrations, and the treating and conditioning chemicals and compounds used in boiler waters do not interfere. Samples of 50 ml or less are required.



PLANNED FORM WORK SPEEDS CONCRETE CONSTRUCTION

Richmond offers without obligation, consultation on the proper types of Forms and Form-Ties to be used for a given job; estimates on job requirements and recommendations on specific Form problems.

Richmond furnishes layout and detail plans covering ties and their application to the form work.

Richmond's method of packing and shipping in accordance with layout plans is a distinct service in itself. Richmond's system of labels and color designations as applied to all cartons and bundles is a definite time-saver, and eliminates confusion. In short, the right material gets to the right spot, without delay.

Richmond's Tyscru principle is that of a wire coil wound to the contour of a lag thread to receive and develop the full strength of the Richmond Tylag bolt. This bolt, by reason of its simple construction and fast thread, can be re-used indefinitely with no depreciation. For instance...½" diameter Richmond Tyscrus have a 5 turn coil (resistance welded) to each end of high tensile wires. These coils are 1" in length, hence they have 5 threads per inch as against 13 machine threads per inch on other tie systems. This is an immediate saving of better than 50% in tightening and stripping time per tie.

Richmond's policy of loaning its Form-Tie working parts (tools) free of any rental charge is a big factor in reduced costs because you only pay for lost parts, not for their *usage*.

Form-Ty Engineering Guide on Request.

Manufacturers of Quality Building Products · The Producers' Council

SEE OUR CATALOG IN SWEET'S

Established 1911

RICHMOND SCREW ANCHOR COMPANY, INC.
816 LIBERTY AVENUE · BROOKLYN, NEW YORK

Time and Labor Saving Construction Devices for Concrete Construction

FOUNDATIONS

PRETEST UNDERPINNING
CONCRETE-STEEL PILES
MASS CONCRETE CONSTRUCTION
HEAVY SHORING
DRILLED-IN CAISSONS

DRILLED-IN CAISSONS
FOUNDATIONS
UNDERPINNING

Send for catalogs descriptive of the latest foundation types and methods.

SPENCER, WHITE & PRENTIS, INC.
10 EAST 40th ST. NEW YORK 16, N. Y.

WYTEFACE "A"
TRADE MARK
STEEL TAPES

K&E
REG. U. S. PAT. OFF.

Easy-to-read, *raised* black graduations on crack-proof white surface . . . resist abrasion from rock, sand, scraping over rails, pipe, concrete, etc. In all sizes and types—in cases or reels. Ask your dealer—or write for catalog.

I'LL TAKE THE **WHITE** ONE EVERY TIME!

INCH
2
TRADE
3
WYTEFACE
STEVENS WYTEFACE "A"
KEUFFEL & ESSER CO.
GRADUATED IN INCHES OR TENTHS

EST. 1867
KEUFFEL & ESSER CO.
NEW YORK · HOBOKEN, N. J.
CHICAGO · ST. LOUIS · SAN FRANCISCO · LOS ANGELES · DETROIT · MONTREAL

Literature Available

BITUMULS HANDBOOK—The American Bitumuls Company, 200 Bush St., San Francisco, Calif., has available for distribution bound copies of their Bitumuls Handbooks. These handbooks contain useful information and brief specifications for engineers and contractors using emulsified asphalt.

DIESEL ENGINES—Pictured in a new 32-page booklet, form 8657, issued by Caterpillar Tractor Co., Peoria, Ill., are some of the tasks its Diesel Engines are doing on the home front. The applications are many and varied and include taking over an airport load, with never a flicker of lights, when an emergency arises; powering boats; lighting municipalities; providing lights and power for service stations, repair shops, hospitals, sawmills, oil fields (drilling, pumping, etc.), mines, and radio stations.

EXPLOSIVE RIVETS—Uses of explosive rivets in peacetime production jobs—in addition to application in the aviation industry which is taking virtually all the supply now—are discussed fully in a new manual. An improved rivet carries the charge running the full length of the shank. When the charge is fired, the blind end forms a barrel-shaped head and, in addition, the shank fills the hole through which it passes. Thus the rivet holes need not be drilled to such close tolerances. The Du Pont booklet cites the following possibilities for postwar uses of explosive rivets: automotive, refrigeration, housing—in the construction of modern prefabricated houses, heating, ventilating and air conditioning, and shipbuilding. E. I. du Pont de Nemours & Co., Inc., Explosives Department, Wilmington 98, Delaware.

FIBRE CONDUIT—The Fibre Conduit Company has issued a new catalog, No. 49, on Orangeburg Conduit. The 20-page catalog contains much helpful information and gives complete data and specifications on Orangeburg Standard Conduit for installation with concrete encasement, and Orangeburg Nocrete Conduit for installation without concrete encasement. Address requests to James R. Connell, Vice-President, The Fibre Conduit Company, 292 Madison Ave., New York 17, N.Y.

FIRE PUMPS—A new line of single-stage, double-suction fire and booster pumps designed for efficient, low-cost fire protection has been announced by Allis-Chalmers Mfg. Co., Milwaukee 1, Wisconsin, in bulletin B6336 recently released. The pumps are approved for heads ranging from 60 lb per sq in. to 108 lb per sq in. at capacities ranging from 500 gpm to 1500 gpm.

GRINDING FACTS—A 136-page reference book on grinding—includes a complete explanation of the new standard marking symbols; a comprehensive schedule of grading recommendations for general, toolroom, diamond wheel, and thread grinding; a description of each common type of grinding; safety rules; and a table of useful speeds. The Carborundum Company, Niagara Falls, N.Y.

MANUALS
of ENGINEERING PRACTICE

AMERICAN SOCIETY OF CIVIL ENGINEERS FOUNDED 1852

SELECTED BIBLIOGRAPHY ON SOIL MECHANICS
HORIZONTAL CONTROL SURVEYS TO SUPPLEMENT THE FUNDAMENTAL NET
TIMBER PILES AND CONSTRUCTION TIMBERS
WATER TREATMENT PLANT DESIGN

1.	Code of Practice	$ .20
2.	Terms Used in Sewage Disposal Practice	.40
3.	Lock Valves	1.00
4.	Selected Bibliography on Construction Methods	1.00
5 and 6.	Charges and Method of Making Charges for Professional Services; No. 5, .80, No. 6, .50, both	1.30
7.	Government Services	.50
8.	Engineering and Contracting Procedure for Foundations	.60
9.	Steel Building Erection	.40
10.	Technical Procedure for City Surveys	1.90
11.	Letter Symbols and Glossary for Hydraulics	.60
12.	Construction Plant and Methods for Flood Control	1.00
13.	Filtering Materials for Sewage Treatment Plants	.60
14.	Location of Underground Utilities	.40
15.	Surveying Terms	.40
16.	Land Subdivision	1.20
17.	Timber Piles and Construction Timbers	.70
18.	Selected Bibliography on Soil Mechanics	1.00
19.	Water Treatment Plant Design	1.90
20.	Horizontal Control Surveys to Supplement the Fundamental Net	.90
21.	Standards of Professional Relations and Conduct	.50
22.	Soils Mechanics Nomenclature	.40
23.	Military Roads in Forward Areas	1.40
24.	Surveys of Highway Engineering Positions and Salaries	1.30
25.	Hydraulic Models	1.70
26.	The Engineer and Collective Bargaining	.50

50% discount from above prices to members, Am. Soc. C. E.

Manual Binder—holds 15 manuals.
Black imitation leather—Price $1.60 (No discount on binder.)

AMERICAN SOCIETY OF CIVIL ENGINEERS
33 W. 39th St., New York 18, N. Y.

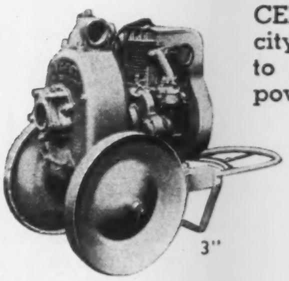
LOOK AHEAD WHEN YOU BUY

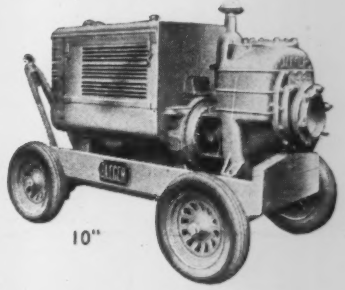
Guaranteed performance is *minimum* performance for JAEGER "Sure Prime" PUMPS

3000 Gallon "Bantam"

Contractors who watch their costs know there's a *big* difference between a Jaeger "Sure Prime" and an ordinary pump of the same size and rating. Jaeger Pumps are built to exceed their promises — deliver their rated capacity under tougher conditions, prime unfailingly and up to 5 times faster, assure you of thousands of *extra* hours of dependable cost-cutting service during the post-war building years ahead.

INDIVIDUALLY TESTED AND CERTIFIED for vacuum, capacity and pressure. Sizes 1½" to 10"; gas, electric or diesel power.


3"


10"

JAEGER DISTRIBUTORS in over 100 cities sell, rent and service "Sure Prime" Pumps.

THE JAEGER MACHINE COMPANY
890 Dublin Avenue, Columbus 16, Ohio

JAEGER *Engineered* EQUIPMENT

"Sure Prime" Pumps, "Speedline" Mixers, "Air Plus" Compressors, "Fleet-Foot" Loaders, Jaeger Hoists, Spreaders and Finishers

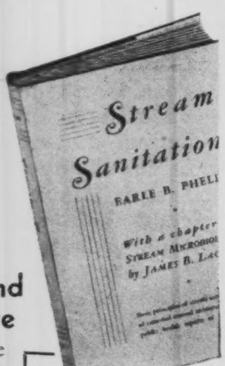
FIRST IMPORTANT BOOK-LENGTH STUDY of STREAM SANITATION

By EARLE B. PHELPS, *Professor Emeritus of Sanitary Science, DeLamar Institute of Public Health of the College of Physicians and Surgeons, Columbia University.*

With a Chapter on
STREAM MICROBIOLOGY
By JAMES B. LACKEY, *Senior Biologist, U. S. Public Health Service.*

This comprehensive treatise covers many problems and phases of Stream Sanitation. Remarkably clear discussions on pollution, self-purification of streams, remedial control measures, and associated practices of water and sewage treatment.

This book is extremely important to civil and sanitary engineers, conservationists, and directors of industrial research. The chapter on stream microbiology is a subject which is little dealt with in other reference books. It supplies information of great value to waterworks and sewage works officials.



Thorough and Authoritative

The author is one of the country's leading authorities on stream sanitation. His valuable researches and wide experience have won him an enviable reputation among scientists and technical men alike. In addition to his vast knowledge of the scientific approach to stream sanitation, Mr. Phelps possesses a remarkable ability to explain a difficult subject clearly.

CONTENTS

- The Life History of a Stream
- Biology of Growth and Decay
- Aerobic Decomposition Oxidation
- Anaerobic Decomposition, Digestion
- The Oxygen Balance
- Public Health Aspects. Bacterial Pollution
- Stream Microbiology
- Index

FREE EXAMINATION

Examine STREAM SANITATION for ten days. If you find that it is the book you want and need, send us a check. If not, return it to us without any obligation on your part.

276 Pages Illustrated $3.25

ON APPROVAL COUPON

JOHN WILEY & SONS, Inc.
440 Fourth Ave., New York 16, N. Y.

Please send me a copy of Phelps' STREAM SANITATION on ten days' approval. At the end of that time, if I decide to keep the book, I will remit $3.25 plus postage; otherwise I shall return the book postpaid.

Name..
Address..
City and State..
Employed by..............................CE-12-44

HARD FACING—A new pamphlet entitled "Cut Costs With Haynes Stellite Hard-Facing Rods" is available from Haynes Stellite Company, Kokomo, Ind., a unit of Union Carbide and Carbon Corporation, in single copies for interested individuals, or in quantity for distribution by welding shops to their customers. This pamphlet explains the advantages of protecting wearing parts by hard-facing with Haynes Stellite alloy, lists typical parts that can be hard-faced in various industries, and illustrates some of these parts.

HIGHWAY LOADERS—A new 6-page folder entitled "To Help You Maintain Better Highways" featuring the Athey Force-Feed Loader is ready for release. It illustrates time- and labor-saving methods of removing and salvaging surplus materials on highway maintenance and construction through the use of the new self-propelled Athey Force-Feed Loader. Athey Truss Wheel Co., 5631 W. 65th St., Chicato 38, Ill.

LOCOMOTIVES—Bulletin No. A-394, 24 pages, covers Vulcan Tank-Type Locomotives for plantation and general industrial service. It also describes and illustrates tender type steam locomotives, Diesel, gasoline and Diesel-electric models. Specifications and capacities are tabulated for each. Vulcan Iron Works, Wilkes-Barre, Pa.

PLASTIC COATINGS—A new catalog on Amercoat Plastic Coatings has been prepared by the manufacturer, American Pipe and Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif. Sixteen fact-filled pages illustrate and describe the many uses of Amercoat in a wide range of industries.

SPRAY NOZZLES—Chain Belt Company, Milwaukee, Wis., has produced a new folder descriptive of Flat Spray Nozzles. These nozzles, made in a variety of sizes and from a variety of materials, are in service in practically all industries where water is used in cleaning, cooling, and washing operations. The folder gives tabular information concerning discharge in gallons per minute; dimensions; a list of materials, sizes, and prices.

UNDERWATER CUTTING AND WELDING—An article on Underwater Cutting and Welding by H. L. Ingram, Jr., of the Applied Engineering Department has been reprinted in booklet form. The article describes the techniques used for both torch and carbon arc cutting and metallic arc welding underwater and lists pressure tables for torch cutting at various depths and tip sizes for cutting materials from 1/4 to 2 in. thick. Air Reduction, 60 East 42nd Street, New York 17, N.Y.

WELDING SYMBOLS CHART—A new wall chart, illustrating the basic characters of welding symbols recommended as American Standard by The American Welding Society, has been published by The Hobart Brothers Company, Troy, Ohio. Twenty-three typical welded joints and sections, covering butt welds, lap welds, tee welds, corner welds, and edge welds, are well illustrated and marked with the standard welding symbols applying to that particular joint or section.

Speed-Up
ALL FIELD SURVEYS!

Preliminary surveys for highway construction, drainage and irrigation systems, dams, water lines, all divisions of civil engineering are speeded up by the *NEW* Paulin Precision Surveying Aneroid. Readings to two feet over a range of 4500 feet are as easy as reading a watch. Other models cover ranges to 18,000 feet. Write for complete literature and FREE COPY of the *Paulin Altimetry Manual.*

AMERICAN PAULIN SYSTEM
1847 SOUTH FLOWER STREET
LOS ANGELES 15, CALIFORNIA

Your WASTE PAPER should fight!

Believe it or not—several hundred thousand different war items are made or wrapped with *paper!* All kinds of waste paper are desperately needed. Yet there's uncollected waste paper in every plant.

Outdated records, dead files, old stationery — brown paper wrappings, corrugated boxes and cartons—they ought to be fighting.

But collections have been lagging. So do your part—help to beat this No. 1 war material shortage. Make sure waste paper is *saved.* Turn it in *now.*

BUSINESS PRESS INDUSTRIAL SCRAP COMMITTEE
(U. S. Victory WASTE PAPER Campaign)
Room 1253 50 Rockefeller Plaza
New York 20, N. Y.

How a B-G Mixer Provides Versatility

• High-type mix . . . intermediate mix . . . low-cost road mix! There is a combination of B-G units to make a plant set-up for producing every type of bituminous mixture.

The B-G Mixer and Bucket Loader form a travel plant that puts quality into low-cost roads. The Mixer, teamed up with a B-G Dual Drum Dryer, is ideal for producing intermediate types of bituminous material. And the addition of a B-G Gradation Control Unit gives you a plant that turns out accurately-proportioned high-type mixes. Barber-Greene Company, Aurora, Illinois.

44-12A

Barber B-G Greene
Constant Flow Equipment

OWN A TRANSIT
BUILT TO
U.S. ARMY
SPECIFICATIONS

Built to the rigid specifications of the U. S. Army Engineers Corps, this transit will do an exacting precision job in a most dependable way. The Type II U. S. Army Transit shown here is recommended for precise municipal, railroad, highway and bridge work.

TELESCOPE is 11½″ long...Internal Focusing...24 diameters magnifying power. HORIZONTAL LIMB...graduated to half degrees, with Verniers to one minute, 6¼″ diameter. COMPASS...Gold Plated Needle, 4½″ long. WEIGHT...Transit, 14½ lbs., Tripod, 11 lbs.

White Engineering Instruments have played an important part in military service—Transits and Levels for the Army Engineers Corps; Theodolites for the Signal Corps; Sextants for the Navy. Can be purchased on Standard MRO rating PR No. 3.

WRITE *today for full information, prices and FREE bulletin on complete line of surveying instruments.*

Expert Repairing on all makes of instruments

DAVID WHITE CO.
319 W. COURT STREET
MILWAUKEE 12, WIS.

ARMY E NAVY

For

★ *Extra Speed!*

★ *Extra Safety!*

ON WINTER CONCRETE JOBS

USE ↓

SOLVAY CALCIUM CHLORIDE

Save time on concrete construction work this winter . . . *despite* low temperatures! Costly waits between operations can be cut . . . the protection period can be reduced.

Solvay Calcium Chloride added to the mix doubles the strength normally developed during early periods . . . overcomes slowing effects of low temperatures . . . provides extra cold weather protection . . . permits re-use of forms and quicker finishing and use of concrete. It does not change the normal chemical action of portland cements and makes for a denser, stronger, more waterproof concrete.

Send for FREE Booklet—"Calcium Chloride and Portland Cement."

SOLVAY SALES CORPORATION
40 Rector St., New York 6, N. Y.

Gentlemen: Kindly send me your free booklet "Calcium Chloride and Portland Cement."

Name. . . . .

Affiliated with. . . . .

Address. . . . .

City. State. . . . .

80-12

They're Going Overboard For Victory—Are YOU?

A13-13
PA 3-27

USE 8-POINT PLAN FOR AN OVERBOARD DRIVE IN THE 6th WAR LOAN!
NOV. 20th TO DEC. 16th

Our fighting men still have a long way to go! But—your plant-wide selling of the 6th can do much to shorten their embattled miles—lessen the price they so willingly pay for victory! Join the coast to coast parade of patriotic firms that are assuring an **"overboard" showing in the 6th** by following through on **every** point in the 8-Point Plan.

- Start the ball rolling by appointing a **6th War Loan Bond Committee**, representing labor, management and other groups.
- Carry on by selecting a **Team Captain**—preferably a returned veteran—for every 10 workers.
- Right at the start, establish a **Quota** for each department—and every employee.
- Arrange frequent **Meetings of Captains**, highlighting importance of their work—effective sales methods—and need for painstaking study of Treasury Booklet, Getting The Order.

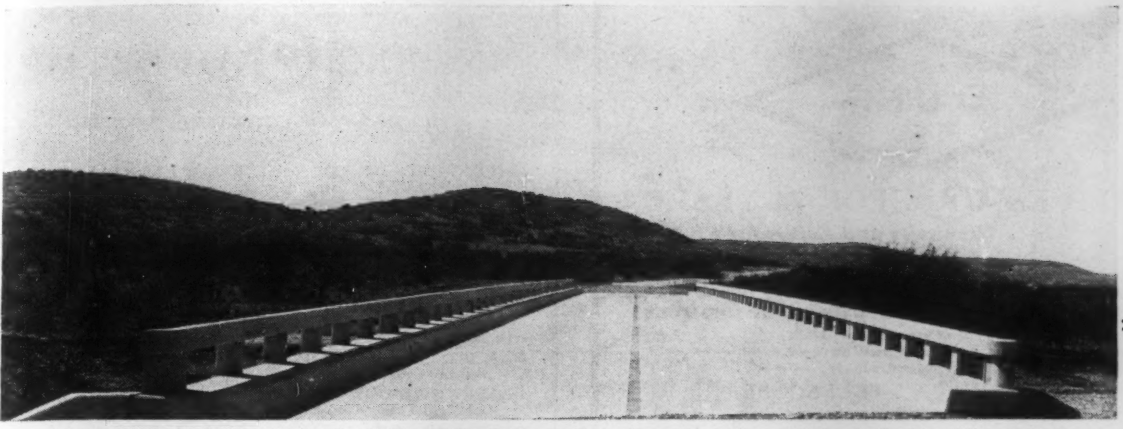
6th WAR LOAN

- Make definite **Assignments** to those best equipped to arrange music, speeches, rallies, competitive progress boards and meeting schedules.
- Issue **Individual Pledge Cards**—made out in the name of each worker and providing for both cash and installment purchase.
- **Resolicit!** This is the secret of "overboard" War Bond subscriptions. Your State Payroll Chairman has a special Resolicitation Plan for you to put into action near the end of the campaign.
- Give generously of your **Advertising Space** to drive home the War Bond story.

The Treasury Department acknowledges with appreciation the publication of this message by

CIVIL ENGINEERING

★ *This is an official U. S. Treasury advertisement—prepared under auspices of Treasury Department and War Advertising Council* ★



Concrete highway bridge over Dry Devils River, Edwards County, Texas, has substantial concrete handrails giving full protection to traffic with little interference with visibility from roadway. Designed by Texas State Highway Department.

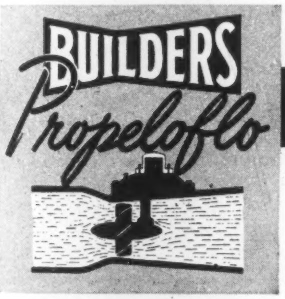
Simple Concrete Handrails
for Safety and Good Visibility

Substantial concrete handrails on this highway bridge in Texas provide adequate safety with good visibility—have sufficient section to give ample protection for all reinforcement.

There are no projections beyond the face of the rail. Harmonious appearance is obtained economically with simple formwork which eliminates need of hand finishing.

Write for copy of 36-page illustrated booklet, *"Architectural Design of Concrete Bridges."* Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION
Dept. 12-13, 33 W. Grand Ave., Chicago 10, Ill.
A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work
BUY MORE WAR BONDS



ACCURATELY MEASURES FLOW IN MAIN WATER LINES

VENTURI DESIGN

Provides excellent velocity distribution where fluid meets propeller, resulting in metering accuracy within 2% over a wide range of flow.

LOW COST
ACCURATE
DIRECT READING
BUILDERS QUALITY

For Bulletin 350 attach to your letterhead and mail to Builders-Providence, Inc. (division of Builders Iron Foundry) 9 Codding St., Providence 1, R. I.

Sincerely,
BUILDERS-PROVIDENCE

FOUNDATION
TEST BORINGS

We look into the earth—

anywhere on earth.

An
Engineering
Service
For
Engineers
By
Engineers

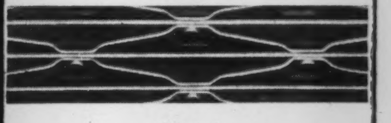
PENNSYLVANIA
DRILLING COMPANY
PITTSBURGH 20, PA.

Complete drilling and grouting service for construction and mining

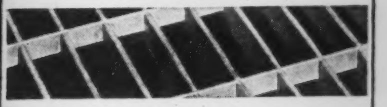
IRVING GRATING

FLOORING AND STAIR TREADS

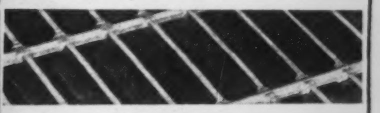
"A Fitting Grating for Every Purpose"



Riveted
Walkways — Stair Steps — Platforms
Trucking Aisles — Trench Covers



Press-Locked
Industrial Plants — Oil Refineries
Chemical Plants — Power Houses
Naval and Merchant Ships
Locomotive, Passenger and Freight Cars



Welded
Catalog for the asking.

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
HOME OFFICE and PLANT: 5008 27th STREET
LONG ISLAND CITY 1, NEW YORK
WESTERN DIVISION: FOOT OF PARK AVE
EMERYVILLE 8, CALIFORNIA

BUFF
TRADE MARK TRADE MARK

WORLD FAMOUS FOR 74 YEARS

Transits and Levels for Civil and Mining Engineers

Buff precision and design are continuously in the forefront

ENGINEERS and contractors know that BUFF performance is accurate and sure—with adjustments that hold permanently.

THE BUFF "X" TELESCOPE

has the finest and highest definition and simplest lens system. It is useful when the light is dim.

Buff is used almost exclusively on the largest works in this country and Canada and Mexico and So. America.

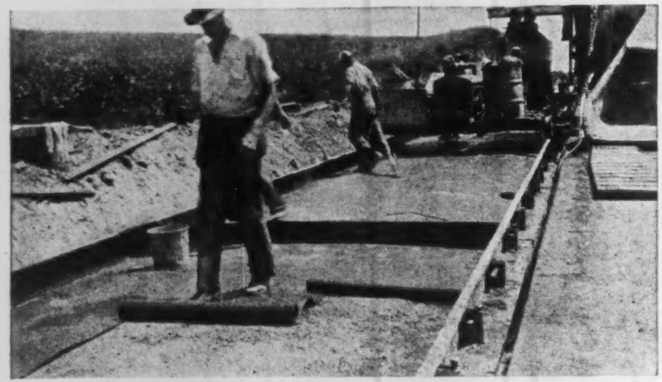
Astronomical lens experts

All makes—intelligently repaired and regraduated by Factory Experts.

The finest work at the LOWEST POSSIBLE COST. Reliability and guaranteed work. A special Souvenir Plumb Bob sent gratis to graduate Civil Engineers.

THE Greatest ACCURACY
THE Hardest BRONZE
THE Simplest DESIGN

Buff & Buff Company
Jamaica Plain, Mass.



INSURE STRONGER PAVING

Reduce Water Content

with Carey Elastite Subgrade Felt

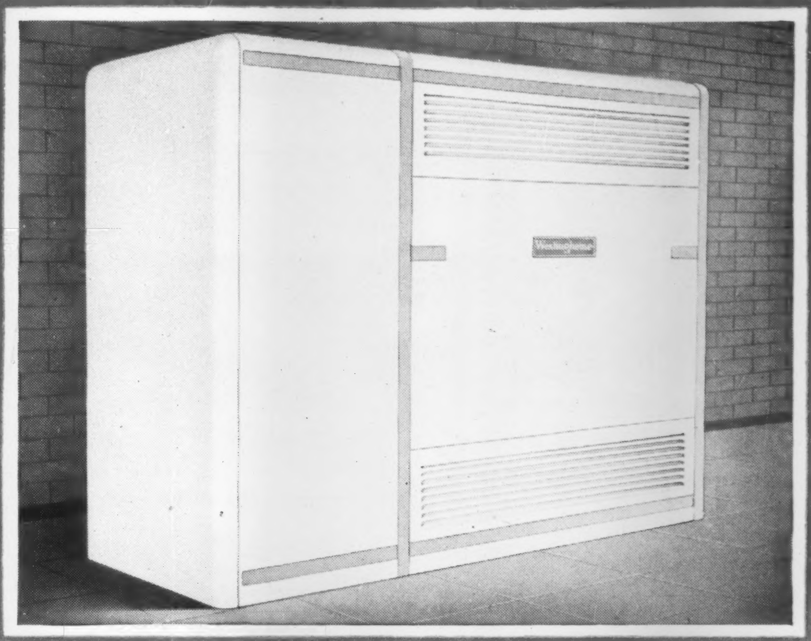
Every Engineer knows that you can make concrete stronger by reducing the water content of the mix. You can use dryer mixes if you waterproof earth subgrades with Carey Elastite Subgrade Felt before placing concrete. This is a strong, tough and inexpensive waterproof paper or felt which prevents absorption of water from the concrete into the Subgrade; makes complete separation between the concrete and Subgrade; makes sprinkling of the Subgrade unnecessary. Write for prices and details. Address Dept. 81.

THE PHILIP CAREY MFG. COMPANY
Dependable Products Since 1873 Lockland, CINCINNATI, OHIO
In Canada: The Philip Carey Co., Ltd. Office and Factory: Lennoxville, P.Q.

INDEX TO ADVERTISERS

and their advertising agencies

AIR EXPRESS DIVISION, RAILWAY EXPRESS AGENCY . 28
Erwin, Wasey & Co., Inc.
ALUMINUM COMPANY OF AMERICA . . . . . *Second Cover*
Fuller & Smith & Ross, Inc.
AMERICAN LUMBER & TREATING COMPANY . . . 35
Fuller & Smith & Ross, Inc.
AMERICAN PAULIN SYSTEM 40
ARKWRIGHT FINISHING COMPANY 30
Horton-Noyes Company
ARMCO DRAINAGE PRODUCTS ASSOCIATION 29
BARBER-GREENE COMPANY 41
Buchen Company
BLAW-KNOX COMPANY 27
Al Paul Lefton Co., Inc.
BUFF & BUFF COMPANY 44
BUILDERS-PROVIDENCE, INC. 43
Hammond-Goff Company
PHILIP CAREY MANUFACTURING COMPANY 44
S. C. Baer Company
CARNEGIE-ILLINOIS STEEL CORPORATION 8
(United States Steel Corporation subsidiary)
Batten, Barton, Durstine & Osborn, Inc.
CATERPILLAR TRACTOR COMPANY 25
N. W. Ayer & Son, Inc.
CEMENT GUN COMPANY 32
CHICAGO BRIDGE & IRON COMPANY 6
Russell T. Gray, Inc.
CRANE CO. 2
Buchen Co.
DOUGLAS FIR PLYWOOD ASSOCIATION 33
Condon Co., Inc.
DRAVO CORPORATION 36
Ray Sayre Advertising Agency
DRILLED-IN CAISSON CORPORATION 32
FAIRBANKS, MORSE & COMPANY 21
Henri, Hurst & McDonald, Inc.
GENERAL ELECTRIC COMPANY 19
G. M. Basford Company
INTERNATIONAL NICKLE COMPANY, INC. 1
Marschalk & Pratt Company
IRVING SUBWAY GRATING CO., INC. 43
JAEGER MACHINE COMPANY 39
Mumm, Mullay & Nichols, Inc.
JOHNS-MANVILLE CORPORATION 4
J. Walter Thompson Company
KEUFFEL & ESSER COMPANY . . . . 7 and 38
St. Georges & Keyes, Inc.
LAYNE & BOWLER, INC. 34
O'Callaghan Advertising Agency, Inc.
LOCK JOINT PIPE COMPANY 12
Needham & Grohmann, Inc.
LONE STAR CEMENT CORPORATION 3
Cowan & Dengler, Inc.
PENNSYLVANIA DRILLING COMPANY 43
PERMUTIT COMPANY 31
Newell-Emmett Company
PORTLAND CEMENT ASSOCIATION 43
Roche, Williams & Clary, Inc.
FREDERICK POST COMPANY 17
Western Advertising Agency
RAYMOND CONCRETE PILE COMPANY . . . . . *Back Cover*
Needham & Grohmann, Inc.
RICHMOND SCREW ANCHOR COMPANY, INC. 37
J. G. Proctor Co., Inc.
SOLVAY SALES CORPORATION 41
Atherton & Currier, Inc.
SPENCER, WHITE & PRENTIS, INC. 38
TRI-LOK COMPANY 36
Ray Sayre Advertising Agency
UNION METAL MANUFACTURING COMPANY 10
The Griswold Eshleman Company
U. S. PIPE & FOUNDRY COMPANY 13
Alley & Richards Company
U. S. STEEL CORPORATION SUBSIDIARY 8
Batten, Barton, Durstine & Osborn, Inc.
UNIVERSAL FORM CLAMP COMPANY 9
William Hoffman & Associates
VAN DER HORST CORPORATION OF AMERICA 5
Fuller & Smith & Ross, Inc.
WALLACE & TIERNAN PRODUCTS, INC. 23
G. M. Basford Company
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY . . . . *Third Cover*
Fuller & Smith & Ross, Inc.
DAVID WHITE CO., INC. 41
Cramer-Krasselt Company
JOHN WILEY & SONS . . . . 36 and 40
Ray-Hirsch Company
WOOD MANUFACTURING COMPANY 15
McCarty Co.



Westinghouse ASL Transformers are available in 150 to 4,000 kva ratings, 15,000 volts and below

1,000,000 kva says OK!

THE ASL TRANSFORMER COMBINES:

1. **GREATER SAFETY**—No cooling liquids—no fire or explosion hazards. No vault is required.

2. **GREATER RELIABILITY**—Winding temperature is not a critical factor in loading . . . heavy overloads carried safely.

3. **LOWER INSTALLATION COST**—Transformers can be placed indoors near load centers—no long secondary runs of heavy copper—no catch basins or drains are required. Lighter weight and easier to handle in the larger ratings.

4. **LOWER MAINTENANCE COST**—No periodic liquid reconditioning—no gasketed joints to maintain, no valves to leak. Maintenance is negligible, even in dust-laden atmospheres.

5. **GREATER SPACE ECONOMY**—In large ratings 1/3 or more of the space that is required by liquid-filled transformers may be saved.

6. **LOWER COMBINED COST**—In major substation design, both air-cooled transformer and metal-clad switchgear with air breakers can be installed INDOORS as a completely metal-enclosed, multiple unit substation . . . saving cable cost, space and installation work.

Dust . . . dirt . . . fumes . . . heat . . . dampness . . . condensation . . . none of these enemies of electrical equipment found in metal-working shops, coal mines or paper mills, in both temperate and tropical zones, have been able to affect the operation of Westinghouse Type ASL Air-Cooled Transformers.

Since their introduction in 1936, Type ASL Transformers have received extensive field testing—particularly by emergency war loads which have compressed decades of normal operation within a few years. Over 2,000 installations, totaling more than 1,000,000 kva, are proof today that the ASL Air-Cooled Transformer is the one right answer for indoor industrial plant distribution systems.

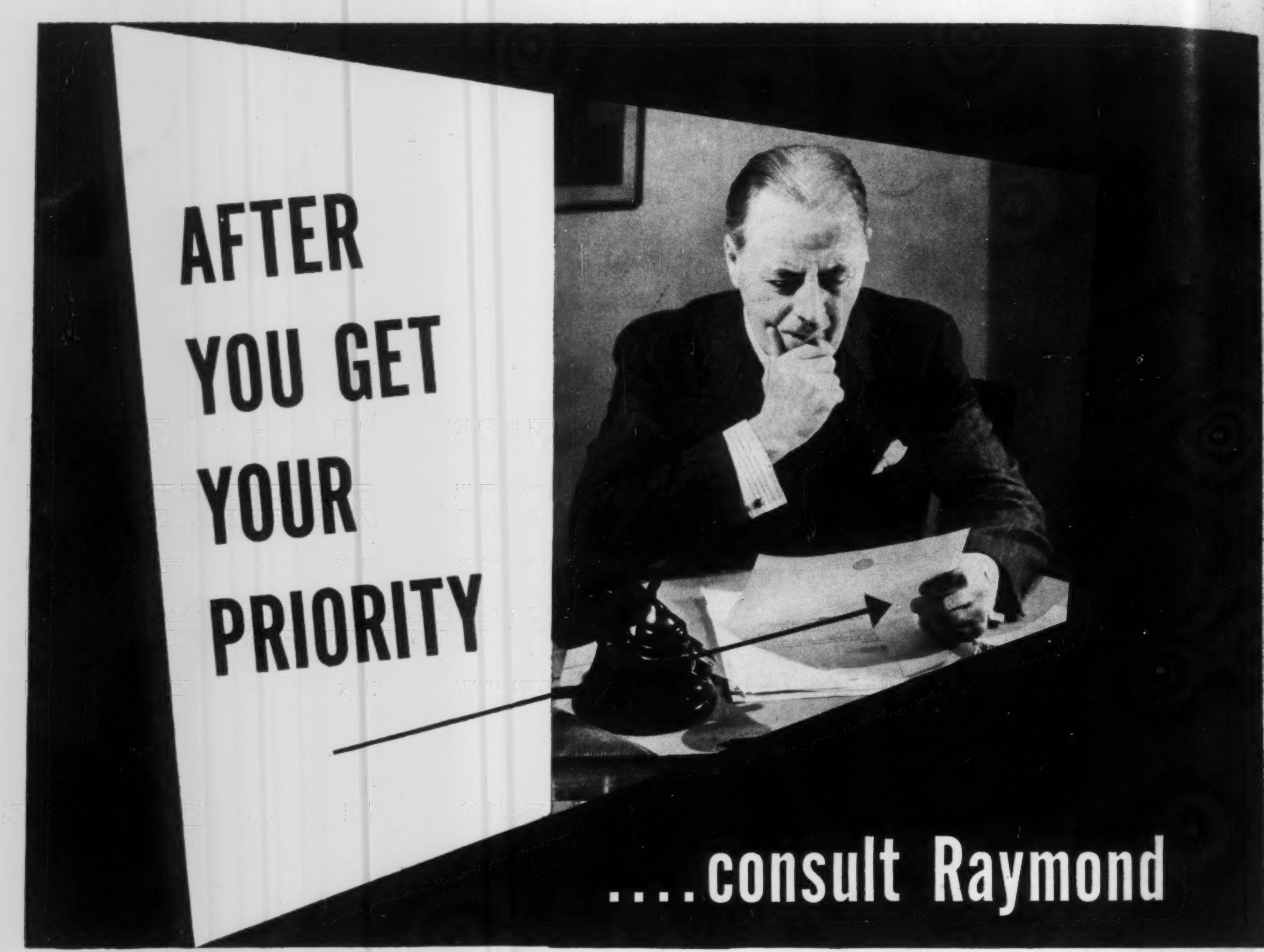
For complete information call your Westinghouse Office, or write Westinghouse Electric & Manufacturing Company, Box 868, Pittsburgh 30, Pa.

J-70434

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Packaged Power



AS SOON as you have Uncle Sam's "green light" to go ahead with new projects, let's get together and talk over your foundation problems. Throughout the past four decades the Raymond organization has successfully completed over 11,000 safe foundations . . . large and small . . . in many parts of the world. During the past few years Raymond has been solely engaged in filling **essential** wartime contracts The experience and technical knowledge gained in these government projects, combined with the research improvements and test methods developed, provide more efficient performance than ever before in (1) the investigation of underground conditions (2) interpreting the results (3) determining the best suited foundation and (4) installing these foundations. Raymond's accumulated knowledge, experience and ability are ready to serve you again. Your inquiries will receive prompt attention.

RAYMOND CONCRETE PILE CO.

140 CEDAR STREET • NEW YORK 6, N. Y. BRANCH OFFICES IN PRINCIPAL CITIES

THE SCOPE OF RAYMOND'S ACTIVITIES includes every recognized type of pile foundation—concrete, composite, precast, steel, pipe and wood. Also caissons, construction involving shore protection, ship building facilities, harbor and river improvements and borings for soil investigation.